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M 70

THE DISTRIBUTION OF TYPHOID AND PARATYPHOID INFECTIONS AMONGST ENTERIC FEVERS AT MUDROS,

*OCTOBER—DECEMBER, 1915.**

BY

LIEUTENANT-COLONEL C. J. MARTIN, A.A.M.C., F.R.S.,

AND

MAJOR W. G. D. UPJOHN, A.A.M.C.,

PATHOLOGISTS TO NO. 3 GENERAL HOSPITAL, A.I.F.

THE early records from France of the incidence during the war of enteric fever upon inoculated and uninoculated British troops showed no significant difference. This was in contrast with results previously obtained, and notably with those patiently collected over three or four years by the War Office Committee appointed to examine into the virtues of antityphoid inoculation, according to whose report the incidence was about 1 to 5½ respectively.[1]

This discrepancy might obviously be accounted for if the prevailing type of enteric infection was not typhoid, but paratyphoid, for Kabeshima[2] has shown that inoculation against typhoid affords no protection against paratyphoid A or B. Accordingly, endeavours were made towards the end of 1914 to differentiate these latter fevers from typhoid.

Early in 1915, Dreyer, Walker, and Gibson[3] published the results of the examination of a limited series of cases at the base hospital at Oxford. They concluded that no case of typhoid fever had occurred in the inoculated individuals of their series, and that, as found by Kabeshima, paratyphoid fevers had occurred with equal frequency among antityphoid inoculated and non-inoculated individuals. Dreyer, Walker, and Gibson (*loc. cit.*) were of opinion that the cases returned as typhoid fever amongst our troops were to a large extent paratyphoidal infections.

A large portion of our work at No. 3 Australian General Hospital at Lemnos consisted in helping our medical colleagues to arrive at an accurate diagnosis of the various intestinal diseases, which bulked so largely in the medical practice of the hospital. To this end, in the case of the enteric fevers, we chose the serological method as our routine procedure. It would not have been possible, with the material and assistance at our disposal, to have made more than one-fifth the number of observations by blood culture, and at least half of these would have miscarried, as so many of the patients were past the first week of the disease on admission.

We were aware that the interpretation of agglutination results would, in the case of persons inoculated against typhoid, be a matter of some difficulty; but we had the advantage of working in close co-operation with our physicians, who kept us in touch with the subsequent history of the patients, so that repeated observations could be made if desirable. We therefore hoped that in the great majority of cases any ambiguity might be removed.

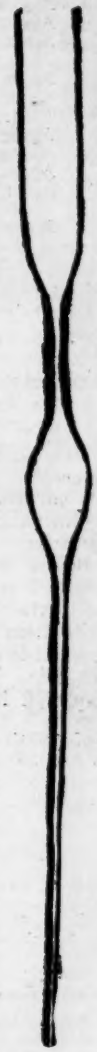
There is no one perfect method for estimating the distribution of the various enteric infections. Conclusions drawn from blood cultures alone are not free from error, for the proportion of successful cultivation is higher in typhoid than in paratyphoid B fever.

During the three months October to December, 1915, we gathered a considerable amount of data, which we shall proceed to deal with, in view of its bearing upon the distribution of enteric fevers at Gallipoli during this part of the campaign.

In carrying out the agglutinations we had from time to time valuable help from Sister Williams and Captains Bahr, Brennan, and Maclure. In scrutinizing the cases whose serums gave an agglutination to typhoid only, the importance of which scrutiny will be emphasized below, we had invaluable help from Lieutenant-Colonel Stawell, Lieutenant-Colonel de Crespigny, and Captain Ercole. To one and all we express our deep sense of gratitude.

METHOD EMPLOYED IN DETAIL.

The emulsions were, in the first instance, made from strains of typhoid, paratyphoid A, and paratyphoid B bacilli obtained from the Lister Institute. The first is a readily agglutinable strain, which has been propagated in the laboratory for several years. The two last are descendants of Schottmüller's original strains. Subsequently we substituted a locally isolated strain of *B. paratyphosus* B, as the Schottmüller's strain did not form good emulsions. The bacilli were grown for twelve hours on nutrient agar, emulsified in saline by gently agitating the bottles, and diluted so as to show definite opalescence when placed in the tubes used for the agglutinations, which were about a quarter of an inch in diameter. Formalin was added to make a concentration of 0.1 per cent. Each brew of emulsion was tested against standard serums obtained from the Lister Institute, which agglutinated all three emulsions up to a dilution of 1 in 16,000. The agglutination was specific in a dilution of 1 in 50. Lower dilutions were not tried. As fresh emulsions were made from time to time, they were tested in the same way against the corresponding standard serum. No significant variation in agglutinability was observed during the course of the observations.



About a fifth of a cubic centimetre of blood was drawn from the patient into a sterile glass pipette and sealed. The blood serum was usually separated from the clot by centrifuging on the same day. For diluting the serum pipettes drawn out in the flame and cut off at a point where their orifice had an external diameter of 1.12 mm. were employed. Such a pipette drops 0.02 c.cm. of serum if held vertically. Two drops made up to 1 c.cm. affords a dilution of 1 in 25. For arranging the series of dilutions we used pipettes drawn so as to leave a small bulb intervening between the two capillary portions (see diagram), which latter should have thick walls. The content of the pipette is arranged so as to equal about half the volume it is desired to work with in the agglutination tubes. The exact content is not material if the same pipette is used throughout the series of dilutions and subsequently for adding the emulsions. For convenience, however, we made two stock sizes of pipettes, which contained 0.15 c.cm. and 0.25 c.cm. respectively. The pipettes in each series were then interchangeable.

The successive dilutions were made by the usual method, namely: Two volumes of the first dilution of serum were placed in tube No. 1 of the series, and into tubes 2, 3, 4, etc., was placed one volume of water. Thereafter, one volume was removed from tube No. 1, emptied into tube No. 2, and mixed. A volume of this mixture was withdrawn and emptied into No. 3, and mixed. One volume withdrawn from tube No. 3 was emptied into No. 4, mixed, and so on until the last tube of the series was reached, when, after mixing, the one volume removed was discarded. In this way each successive tube contained serum twice as dilute as the previous one. The procedure having been carried out in triplicate, to every tube in a series an equal volume of emulsion of typhoid, or paratyphoid A, or paratyphoid B bacilli respectively, was added and the contents mixed. The tubes were placed in the incubator at 37° C. for two hours, allowed to remain on the bench for one hour, and the results read.

The following conventional series of marks was awarded and will be employed in this communication:

Complete agglutination	+++
Agglutination visible to the naked eye	++
Agglutination visible with lens magnifying 4 diameters	+
No agglutination visible with lens magnifying 4 diameters	−

The serums of 350 patients were tested against *B. typhosus*, *B. paratyphosus* A, and *B. paratyphosus* B in dilutions of 1 in 100, 1 in 200, 1 in 400, and 1 in 800. In the remainder the 1 in 800 dilution was omitted to save labour, as it was found that the results could, in most cases, be equally well read without it. After the first two months a lower dilution, 1 in 50, was employed for the paratyphoid A series, as we found that we were missing some

* A paper read to the Anzac Medical Association, Cairo, on February 20th, 1916.

infections due to this organism by beginning at 1 in 100. For reasons which will be entered into later these cases were generally recorded as typhoid.

RESULTS.

Observations were made upon the serums of 627 patients and 151 normal persons. As we were functioning as the clinical laboratory of a large general hospital, the patients whose serums we examined were not all enterics. If the medical officer thought that a serological examination would help him towards a diagnosis, the blood was sent to the laboratory. The 627 patients consequently included a number who were suffering from other febrile diseases.

In Table I below are set forth the gross results:

TABLE I.

No agglutination (minimal dilution of serums 1 in 50 or 1 in 100)...	163
Agglutination to *B. typhosus*	138
Agglutination to *B. paratyphosus* A	66
Agglutination to *B. paratyphosus* A and *B. typhosus*	136
Agglutination to *B. paratyphosus* A, *B. typhosus*, and *B. paratyphosus* B (last slight or transient)...	9
Agglutination to *B. paratyphosus* A and *B. paratyphosus* B (latter slight or transient) ...	2
Agglutination to *B. paratyphosus* B	19
Agglutination to *B. paratyphosus* B and *B. typhosus*	88
Agglutination to *B. paratyphosus* B, *B. typhosus*, and *B. paratyphosus* A (last slight or transient)...	5
Agglutination to *B. typhosus* and *B. paratyphosus* A (latter slight or transient) ...	1
	627

INTERPRETATION OF AGGLUTINATION FINDINGS IN PATIENTS PREVIOUSLY INOCULATED AGAINST TYPHOID FEVER.

Agglutination of B. typhosus.

Dealing, as we were, with a population almost entirely inoculated against typhoid within fourteen months, it is not surprising that 376 ont of the 627 should show an agglutination to *B. typhosus* in a dilution of 1 in 100 or upwards.

Before we are able to draw any conclusions from our results, it is first necessary to ascertain, with the technique used, the amount of agglutination which occurs from inoculation only. To determine this, the blood of members of the staff and hospital orderlies, who had not been sick, was examined under similar conditions to those employed in the case of patients.

Agglutination Titre for B. typhosus of the Serums of 75 Healthy Persons Inoculated against Typhoid 7 to 14 Months Previously.

7	agglutinated in a dilution of	... 1 in 800
12	,, ,,	... 1 in 400
22	,, ,,	... 1 in 200
16	,, ,,	... 1 in 100
18	did not agglutinate in a dilution of	1 in 100.

That is, two-thirds showed an agglutination titre of 1 in 200 or upwards and in 10 per cent. it was 1 in 800 or upwards.

In addition to the above experiment, the pooled serums of twenty-eight men inoculated on the same day fourteen months previously was found to give a good agglutination at 1 in 200—a result in close agreement with the above.

It follows, therefore, that in an inoculated person an agglutination of *B. typhosus* by his serum, up to the limits observed by us in patients, is not necessarily significant of typhoid infection, and that in order to arrive at a diagnosis of typhoid fever in our cases other means must be resorted to.

When we commenced our observations we were under the impression that the progressive development of typhoid agglutinins during the course of illness, reaching sometimes a titre of 1 in 1,000 or upwards, might, in the absence of any discoverable agglutinins to *B. paratyphosus* A or B, be taken as evidence of typhoid fever.

We were strengthened in this belief by the conclusions arrived at by Dreyer, Walker and Gibson (*loc. cit.*), who pointed out, quite rightly, that a differential diagnosis may be arrived at by measuring the agglutination titre to typhoid and paratyphoid bacilli respectively over a period of a few days. This method is, however, beset with pitfalls.

Early in our observations, as we shall proceed to show, it became apparent that many serums agglutinating one of the paratyphoid bacilli simultaneously agglutinated typhoid bacilli to an unexpected degree. Further, in a number of cases of paratyphoid fevers in which repeated observations were carried out, a progressive development of typhoid agglutinins preceded by one to two weeks the development of agglutinins to the paratyphoid bacillus. We give below examples illustrating this phenomenon in which paratyphoid bacilli were isolated. Unless the observations had been persisted in, all of these would have been diagnosed as typhoid fever. We ought to have been alert to this possibility, for in 1911 Grattan and Harvey[4] described its occurrence in paratyphoid A fever in India. It was also drawn attention to by Firth,[5] and later by Safford.[6]

No. 3729.

	1 : 100.	1 : 200.	1 : 400.	1 : 800.
Before illness:				
B. typhosus	++	−	−	−
B. paratyphosus A	−	−	−	−
B. paratyphosus B	−	−	−	−
After 1 week:				
B. typhosus	+++	+++	++	−
B. paratyphosus A	−	−	−	−
B. paratyphosus B	−	−	−	−
After 2 weeks:				
Agglutination the same. B. paratyphosus A was recovered from urine.				
After 3 weeks:				
Agglutination the same.				
After 4 weeks:				
Agglutination the same.				
After 5 weeks:				
B. typhosus	+++	+++	+	−
B. paratyphosus A	+++	+++	+++	++
B. paratyphosus B	−	−	−	−

B. paratyphosus A was isolated from the faeces in the fourth week.

No. 3681.

	1 : 100.	1 : 200.	1 : 400.	1 : 800.
First week of illness:				
B. typhosus	−	−	−	−
B. paratyphosus A	−	−	−	−
B. paratyphosus B	−	−	−	−
Third week of illness:				
B. typhosus	+++	+++	++	+
B. paratyphosus A	−	−	−	−
B. paratyphosus B	−	−	−	−
Fourth week of illness:				
B. typhosus	+++	+++	++	+
B. paratyphosus A	++	+	−	−
B. paratyphosus B	−	−	−	−

B. paratyphosus A was recovered from the sputum and pleural exudate during the third week of illness. The patient died in the fourth week with gangrene of the lung and localized pleurisy. B. paratyphosus A was recovered in pure culture from the spleen. The bile was sterile.

No. 3778.

	1 : 100.	1 : 200.	1 : 400.	1 : 800.
First week of illness:				
B. typhosus	−	−	−	−
B. paratyphosus A	−	−	−	−
B. paratyphosus B	−	−	−	−
Second week of illness:				
B. typhosus	++	+	−	−
B. paratyphosus A	−	−	−	−
B. paratyphosus B	−	−	−	−
Third week of illness:				
B. typhosus	+++	+++	++	+
B. paratyphosus A	+++	+++	+++	+
B. paratyphosus B	−	−	−	−

B. paratyphosus A was recovered from the faeces during the third week.

No. 522.

	1 : 100.	1 : 200.	1 : 400.	1 : 800.
Second week of illness:				
B. typhosus	+++	+	−	−
B. paratyphosus A	−	−	−	−
B. paratyphosus B	−	−	−	−
Third week of illness:				
B. typhosus	+++	+++	++	+
B. paratyphosus A	−	−	−	−
B. paratyphosus B	−	−	−	−
Fifth week of illness:				
B. typhosus	+++	+++	++	+
B. paratyphosus A	−	−	−	−
B. paratyphosus B	+++	+++	+++	+++

The patient died in the sixth week of illness. A pure culture of B. paratyphosus B was isolated from the spleen and bile. The heart blood taken *post mortem* agglutinated B. paratyphosus B in a dilution of 1 in 10,000.

In the instances detailed above infection with one of the paratyphoid organisms stimulated the production of typhoid agglutinins early in the disease, and it was not until as late as the third to fifth week that the titre for the infecting organism rose to 1 in 100. This occurred in about 2 per cent. of our cases, all, with one exception, paratyphoid A fevers.

As soon as we became aware of these facts we regarded the development of typhoid agglutinins in a patient previously inoculated against typhoid fever with suspicion, and he was only diagnosed as typhoid when *B. typhosus* was isolated, or, as being clinically a case of one of the enteric group of fevers, when no evidence of paratyphoid infection could be obtained. Even so, we have reason to believe that some cases of infection with *B. paratyphosus* A were returned as typhoid, for occasionally the development of agglutinins to this organism is slight and transient.

In order to throw some further light upon the interpretation of the rise in typhoid agglutinins in paratyphoid infections we inoculated healthy persons, some of whom had previously received antityphoid vaccine, with paratyphoid A and B bacilli. In about half of those who had been previously inoculated this was followed by the considerable development of typhoid agglutinins. The instances given below were amongst the most striking:

	1 : 100.	1 : 200.	1 : 400.	1 : 800.
No. 1001.				
Inoculated against typhoid six months previously:				
B. typhosus	−	−	−	−
B. paratyphosus A	−	−	−	−
B. paratyphosus B	−	−	−	−
Eleven days after injection of 200 million each of B. paratyphosus A and B:				
B. typhosus	+++	+++	+++	++
B. paratyphosus A	+++	+++	+++	+++
B. paratyphosus B	+++	+++	+++	++
No. 1002.				
Inoculated against typhoid five months previously:				
B. typhosus	−	−	−	−
B. paratyphosus A	−	−	−	−
B. paratyphosus B	−	−	−	−
Ten days after injection of 200 million each of B. paratyphosus A and B:				
B. typhosus	+++	+++	++	−
B. paratyphosus A	+++	+++	+++	+++
B. paratyphosus B	++	−	−	−
Fifteen days after above;				
B. typhosus	+++	+	−	−
B. paratyphosus A	+++	+++	+++	+++
B. paratyphosus B	++	−	−	−
No. 1008.				
Inoculated against typhoid twelve months previously:				
B. typhosus	−	−	−	−
B. paratyphosus A	−	−	−	−
B. paratyphosus B	−	−	−	−
Seven days after inoculation with 50 million each of B. paratyphosus A and B:				
B. typhosus	+++	+++	+++	+++
B. paratyphosus A	+++	+++	+++	++
B. paratyphosus B	+++	++	+	−
No. 1010.				
Inoculated against typhoid six months previously:				
B. typhosus	++	−	−	−
B. paratyphosus A	−	−	−	−
B. paratyphosus B	−	−	−	−
Eleven days after second inoculation with 500 million each of B. paratyphosus A and B:				
B. typhosus	+++	+++	+++	+++
B. paratyphosus A	+++	+++	+++	+++
B. paratyphosus B	+++	+++	++	+
No. 1012.				
Inoculated against typhoid seven months before:				
B. typhosus	++	−	−	−
B. paratyphosus A	−	−	−	−
B. paratyphosus B	−	−	−	−
Fifteen days after inoculation with 50 million B. paratyphosus A:				
B. typhosus	+++	+++	+++	++
B. paratyphosus A	+++	+++	+++	+++
B. paratyphosus B	−	−	−	−
No. 1,013. (Non-inoculated. No agglutination to typho'd or paratyphoid A or B bacilli in 1 : 100.)				
Ten days after inoculation with 200 million each of B. paratyphosus A and B:				
B. typhosus	−	−	−	−
B. paratyphosus A	+++	+++	+++	++
B. paratyphosus B	+++	+++	++	−
	1 : 100.	1 : 200.	1 : 400.	1 : 800.
No. 1014. (Non-inoculated.)				
Nine days after 200 million each of B. paratyphosus A and B:				
B. typhosus	−	−	−	−
B. paratyphosus A	+++	+++	++	+
B. paratyphosus B	+++	++	−	−
No. 1015. (Non-inoculated.)				
Ten days after 250 million each of B. paratyphosus A and B:				
B. typhosus	−	−	−	−
B. paratyphosus A	+++	+++	+++	+++
B. paratyphosus B	++	+	−	−

Harvey and Wood [7] found, in the cases of paratyphoid A fever which they studied, that the agglutinins for both *B. typhosus* and *B. paratyphosus* A were absorbed by an emulsion of the latter, whereas an emulsion of typhoid bacilli only absorbed the homologous agglutinins. According to this observation, we are merely dealing with an example of group agglutinins. Co-agglutinins were certainly produced in some of our patients, but we doubt whether this is the whole explanation, as it did not occur when individuals not inoculated against typhoid were injected with a vaccine containing only *B. paratyphosus* A and *B. paratyphosus* B. We also tried to absorb the agglutinins for typhoid bacilli in two instances, where they were well developed, by shaking out with a strong mixed emulsion of paratyphoid A and B bacilli, but only succeeded in reducing them. The development of well-marked agglutination to typhoid bacilli weeks before the specific agglutinins arrived suggests another interpretation, namely, that in an inoculated person the mechanism for the manufacture of typhoid agglutinins being already laid down, the introduction of paratyphoid organisms stimulates this mechanism to further activity.

Agglutination of B. paratyphosus A or B. paratyphosus B, or both of these Organisms.

The serum of 326 cases agglutinated *B. paratyphosus* A or B in dilutions of 1 in 100 and upwards. In 238 of these more or less agglutination of *B. typhosus* was exhibited also. Nevertheless, for reasons entered into above, in individuals inoculated against typhoid, these were returned as paratyphoid A or B fevers respectively, and whenever opportunity afforded to confirm this by isolation of the infecting organism the conclusion was found to be justified. With the dilutions we employed, in 95 per cent. of the cases the results were unequivocal, but in 17 out of a total of 326 the serum agglutinated both *B. paratyphosus* A and *B. paratyphosus* B. The agglutination generally occurred in considerably higher dilution with one than with the other, so as to leave little doubt as to the diagnosis. In a few cases this was not so, and it was impossible to say from one examination which was the infecting organism, and a second or third observation at intervals of about a week was made. At the same time efforts were made to recover the organism responsible for infection.

The following are examples illustrating how the diagnosis was cleared up by a second examination of the blood:

No. 538.

	1 : 100.	1 : 200.	1 : 400.	1 : 800.
November 6th, 1915:				
B. typhosus	+++	+++	+++	+++
B. paratyphosus A	+++	++	−	−
B. paratyphosus B	+++	+++	+++	+++
November 18th, 1915:				
B. typhosus	+++	++	−	−
B. paratyphosus A	−	−	−	−
B. paratyphosus B	+++	+++	+++	+++

B. paratyphosus B was recovered from the faeces.

No. 449.

	1 : 100.	1 : 200.	1 : 400.	1 : 800.
October 23rd, 1915:				
B. typhosus	+	−	−	−
B. paratyphosus A	+++	+++	+++	+++
B. paratyphosus B	++	++	+	−
November 1st, 1915:				
B typhosus	+	−	−	−
B. paratyphosus A	+++	+++	+++	+++
B. paratyphosus B	−	−	−	−

B paratyphosus A was recovered *post mortem*.

No. 548.

	1 : 100	1 : 200.	1 : 400.	1 : 800.
November 7th, 1915:				
B. typhosus	++	+	−	−
B. paratyphosus A	+++	+++	+++	+++
B. paratyphosus B	+++	+++	++	+
November 16th, 1915:				
B. typhosus	+	−	−	−
B. paratyphosus A	+++	+++	+++	+++
B. paratyphosus B	+	+	−	−

No. 379.

	1 : 100.	1 : 200.	1 : 400.	1 : 800.
October 16th, 1915:				
B. typhosus	+	−	−	−
B. paratyphosus A	++	+	+	+
B. paratyphosus B	+	+	+	+
November 15th, 1915:				
B. typhosus	−	−	−	−
B. paratyphosus A	+++	+++	+++	+++
B. paratyphosus B	++	+	−	−

In making a diagnosis we have regarded the organism for which agglutinins persisted as responsible for the infection. In those cases in which we succeeded in isolating the causal organism this view was justified.

The amount of co-agglutinins present at an early stage of the illness in 5 per cent. of patients with paratyphoid fevers is noteworthy. Compared with our standard serums made by injecting rabbits with a laboratory strain of paratyphoid A or B bacilli it is considerable. It must be remembered, however, that the standard serums were made from strains selected on account of their specificity, whereas the "wild" strains occurring in nature are not always so specific. Further, it is probable that man is not as good an animal to use for the manufacture of highly specific serums for this group of organisms, in this respect resembling the horse rather than the rabbit.

Analysis of Observations.

We are now in a position to proceed to the analysis of our observations and see what indications they afford as to the distribution of different enteric fevers at Gallipoli. The 163 instances in which the serum gave no agglutination in the minimum dilution used—1 in 100—may be summarily dismissed, as they furnish no information. They comprise cases in which the serum was sent for examination too early in the disease, and others in which the subsequent clinical history indicated that the patient was suffering from some disease other than one of the enteric fevers.

The total number of cases in which agglutination with one or more of the bacilli of the enteric group was observed was 464.

Of these, 213 serums agglutinated *B. paratyphosus* A, and are, for reasons given above, regarded as significant of paratyphoid A infection. For parallel reasons we regard 113 as infections by paratyphoid B.

The determination of the number of typhoid infections is not so simple.

The 138 cases in whose serums only typhoid agglutinins were discovered were not necessarily typhoid fevers, for all but five of the patients had been inoculated. These five exceptions we place to the credit of typhoid infections on the agglutination findings. In seven other cases we succeeded in isolating *B. typhosus* from the blood or excreta either during life or after death, leaving 126 cases in which the serological observations might be interpreted either by previous inoculation or by recent infection.

Medical officers were in the habit of sending blood to the laboratory for serological examination whenever they suspected that they might be dealing with a case of one of the enteric fevers and sometimes irrespective of the time the patient had been ill. Consequently there are in this group a number of cases which subsequently proved to be dysentery, pneumonias, malaria, influenza, or relapsing fever. It also includes 35 cases of epidemic jaundice in which serological observations were deliberately made, as there was a widespread impression at first that the disease was associated with infection by a paratyphoid organism. We may eliminate these 35 cases of jaundice from further consideration, as whatever the infective agent may have been there was no evidence that it was due to a paratyphoid bacillus.

The remaining 91 cases were either investigated at the time or their records carefully scrutinized for us by Lieutenant-Colonel Stawell, consulting physician to our unit, and we take this opportunity of expressing to him our exceeding gratitude. Without his assistance in this matter it would not have been possible to draw what is perhaps the most important conclusion from our observations—namely, the relative prevalence of true typhoid fever at Gallipoli. After submission to his scrutiny, these 91 cases which might possibly have been typhoid infections were reduced to 13. This number includes all those which, on clinical grounds, might have been cases of one or other of the enteric fevers. It is certainly a maximal estimate, for, as mentioned above, we have reason to believe that some cases of paratyphoid A fever, which the method we employed failed to discover, are included in it.

The results of the analysis of our observations after this eliminative procedure had been applied to the cases whose serums agglutinated only *B. typhosus* are as follows:

Cases of typhoid fever... ...	25	... 7 per cent.
Cases of paratyphoid A fever ...	213	... 61 ,,
Cases of paratyphoid B fever ...	112	... 32 ,,
Total of enteric fevers ...	350	

The patients at No. 3 General Hospital, A.I.F., were derived from Gallipoli and the lines of communication. Imperial troops and Australians were indiscriminately admitted. As the sample covered by our observations was of fair size we shall not commit a serious error if we apply our conclusions to the distribution of enteric fevers at the Dardanelles.

From information kindly furnished us by Colonel Aldridge, R.A.M.C., there were 5,700 cases returned as enteric fevers from this area from the commencement of the campaign until the middle of December, 1915. According to a statement made by the Under Secretary for War in the House of Commons on December 23rd, the total medical casualties during the same period were 96,683.

If we further assume that the distribution we have arrived at is applicable to the whole of this period, the invaliding rate from typhoid fever represents less than ½ per cent. of the total sickness during the period.

This highly satisfactory result must presumably be attributed to antityphoid inoculation, for the conditions were not unfavourable to the spread of enteric disease.

As soon as we became aware from our observations that the great proportion of the cases of enteric fevers amongst Australian troops was due to paratyphoid infections, we represented the facts to the Director Medical Services of the Commonwealth forces and advised that Australian troops should be at once inoculated with a vaccine containing paratyphoid and typhoid bacilli. This recommendation was approved by the Minister for Defence, and early this year all Australian units were so inoculated.

Henceforth, the interpretation of observations upon the agglutination of enteric organisms will, in the case of patients belonging to Australian units, be too difficult to possess any practical value, and the isolation of the infecting organism must be resorted to for diagnosis.

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E. P. R. RYAN, D.D.S., of New York, publishes a case in which seven unerupted teeth were detected by the use of the *x* rays in the upper maxilla of a woman aged 34 (*Journ. Amer. Med. Assoc.*, July 1st, 1916). She had suffered for several years from a fistula draining into the right nostril. A nest of six supernumerary teeth was detected, but extraction proved difficult, as they were tightly packed and embedded in bony tissue. The removal of a large unerupted central incisor proved even more troublesome.

BRILLIANT GREEN AND TELLURIC ACID IN THE ISOLATION OF TYPHOID-PARATYPHOID BACILLI.

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Of the recent methods that have been advocated for the isolation of the enteric organisms (typhoid and paratyphoid bacilli) from the excreta of patients or carriers, probably that which has excited most interest and not a little controversy is the brilliant green method of Browning, Gilmour, and Mackie.[1] Support has been lent to it by the observations of Dreyer, Ainley Walker, and Gibson,[2] Stokes and Clarke,[3] Robinson and Rettger,[4] and others. Adverse opinions have mostly been expressed privately, though Robinson[5] states definitely that it has no value. Teague and Clurman[6] conclude that it must be regarded as a failure. In view of these latter opinions I venture to publish the results of a controlled test over a period of three weeks at the beginning of this year. The hospitals to which this laboratory is attached are the final hospital dépôts for soldiers convalescent from enteric and dysenteric diseases and obscure febrile conditions clinically resembling them. It is exceedingly important that no carriers should be allowed to rejoin their units in camp. Perhaps in the majority of cases the organisms are readily isolated from the faeces or urine of carriers; sometimes even they are so abundant and the condition of the bowel or its contents so abnormal that they appear in pure culture on bile-salt plates. Sometimes, again, we may fail to find evidence of their presence in known carriers, and it has been supposed that there are periods when the carrier passes no enteric bacilli. The probability, however, is that we only fail to find them because they are swamped by normal inhabitants of the intestines. At the time mentioned, the percentage of carriers found was below the average, for several months had in many cases elapsed since any illness had been complained of, or the history had been so obscure as to cast great doubts on the supposed nature of the previous illness. It seemed a good opportunity for testing Browning's method as against that adopted as a routine. Browning's method consists in the interposition of brilliant green peptone water as a means of suppressing much of the contamination before the suspected material is spread on solid media for the isolation of the bacteria. Various dye stuffs have been in use from time to time with the idea of cutting out the common bacteria of the colon—methyl-violet, malachite green, etc. Conradi was the first to employ brilliant green for the isolation of typhoid bacilli from stools. He used it along with picric acid in solid media, but as this dye develops its best bactericidal effects in media which are very faintly alkaline to litmus, Conradi obviously weakened much of its power by adding to it picric acid. Further, a mixture of organisms of various kinds with varying resistance, such as one gets in faeces, cannot be so well subjected to the uniform action of a chemical substance on solid as in liquid medium. If one may so express it, on the surface of a solid medium the organisms scarcely do more than wet their feet in the dye. In a liquid medium all the surfaces are equally prone to attack.

Browning, Gilmour, and Mackie,[7] as the result of experiments with various dyes, concluded that brilliant green in very weak solution had a specially inhibitory effect on the colon bacillus as contrasted with typhoid and paratyphoid bacilli, whilst it had a powerfully bactericidal action on practically all other organisms. This fact I have already made use of in the treatment of septic wounds.[8] It must be insisted on that in the isolation of enteric organisms the effect on colon bacilli is an inhibitory one mostly, and that if sufficient time is allowed, or if unsuitable concentrations of the dye are employed, or if there is too heavy an inoculation of our culture tubes, then the various adventitious bacteria may multiply to such an extent as to crowd out those of the typhoid-paratyphoid group. Again, all strains either of colon bacilli or enteric bacilli are not equally susceptible or resistant to the same concentration of the bactericidal substance; and, for this reason, Browning and Mackie advised the employment of five or six different concentrations of brilliant green in peptone water. This is a refinement which is practically impossible of adoption as a routine measure in a laboratory dealing daily with a large number of specimens. From a careful test of 100 specially selected cases with five concentrations, I was not convinced that anything is to be gained by this; for in those cases in which enteric organisms were isolated by the brilliant green method where the direct plate failed, as also in those cases where direct plate and brilliant green method agreed, the typhoid and paratyphoid bacilli were caught by the two highest concentrations which the authors of the method advocate. Browning practically admits this, seeing that where he succeeded with his method when the direct plate method failed he generally obtained pure cultures in the highest concentration of brilliant green, and if he insisted on the longer method he would apparently do so only when a small number of cases was to be tested. Owing to the considerations already mentioned this is no doubt a useful precaution, but as a routine measure it is not convenient. Stokes and Clarke have already reported very favourable results with one concentration only, and my results agree with theirs.

In addition to brilliant green, Browning and Mackie used telluric acid in their medium because they found that certain organisms amongst others, giving the ordinary sugar reactions of the enteric group but differing from them in fermenting inosite, escaped the action of brilliant green alone, but were killed off by the addition of telluric acid.[9] I have therefore always used both in conjunction. Even then we may get organisms surviving which we judge from all the tests we employ not to belong to the group, but the number of such is incomparably less than in the direct plate method. I have compared the results of Browning's method and the direct MacConkey plate, dealing with the same specimens, in over a thousand cases—a sufficiently practical test on which to pass judgement—and the conclusion can safely be drawn that, by Browning's method a larger number of carriers can be detected. It happens sometimes that the direct plate succeeds when the indirect method fails; and the hypercritical might suggest that when the indirect method succeeds and the direct method fails, such a result is only due to the increase in the usual number of plates spread—that is to say, if we spread three MacConkey plates directly instead of two MacConkey plates directly and another after the interposition of brilliant green, we should get the same results. From my results I should have no hesitation in preferring the brilliant green method alone if I were confined to a choice between that and the MacConkey plate, but the use of the two, where it is possible, would be nearer an ideal. Browning and his collaborators do not discard the ordinary method. By the use of brilliant green we cut out a great deal of unnecessary work by throwing out large numbers of "likely" colonies that would turn out in the long run to be quite useless for our purpose, and we suppress entirely, or restrain to moderate degrees, the growth of organisms normally found in faeces; above all, we succeed in obtaining pure growths or numerous easily identified colonies on plates of the organisms for which we seek.

In the method as given by its authors a loopful of liquid faeces is transferred directly to the brilliant green peptone water, incubated for twenty-four hours, and, from this, stroke cultures are made on MacConkey plates. When the faeces are not obtained in fluid form saline emulsions are made. Of course one can generally ensure that the stools are liquid by purging the patient. The difficulty when dealing with soldiers is that many will not swallow a pill, and we have to take the faeces as we get them. Consequently as a routine measure we emulsify the faeces in peptone broth by shaking up a roughly pea-sized portion with 5 c.cm. of bouillon. A drop of this is taken and spread on bile-salt agar plates by means of a glass spreader. I allowed these broth emulsions then to stand for a few hours in the incubator, and at the end of that time two loopfuls of the supernatant fluid were transferred to tubes of brilliant green peptone water with the dye in a concentration of 1 in 200,000 (0.5 c.cm. of 1 per cent. aqueous solution of brilliant green to 1 litre of peptone water), telluric acid, which does not affect the reaction of the medium, being added in a proportion of 1 to 25,000. These were incubated for eighteen hours, and from each three successive strokes were made on small MacConkey plates, using one plate for two specimens. I have convinced myself by control experiments that the best results are obtained by transferring some of the broth emulsion after incubation to the

brilliant green. By so doing we more frequently get pure cultures of the organisms of the group, and where they are not present we much more often succeed in obtaining sterile plates. Stokes and Clarke adopt pretty much the same technique. If we put the faeces direct into brilliant green peptone water it is exceptional to get pure cultures or negative plates. Frequently the medium is decolorized, and when it is decolorized we may be sure that colon bacilli are present in abundance. On the other hand, by the modification I have adopted decolorization of the medium is very uncommon; indeed, it is practically impossible to tell whether there is growth or not in brilliant green until after we have plated out.

When likely colonies are obtained, the same routine is adopted as in the case of the direct plates. They are transferred to lactose peptone water. If after forty-eight hours no fermentation results, the organism is tested on glucose, mannite, dulcite, maltose and broth, and then submitted to the final test of agglutination by specific serums. The direct plates were examined by the whole laboratory staff—five in all—whereas the indirect method was carried on throughout by myself. That alone indicates the saving of work of which the method is capable.

Results of the Examination of 1,023 Specimens.

Result.	No. of Cases with Likely Colonies.	Lactose Fermenters.	Carried to other Sugars.	Necessary Agglutination Tests.	Actual Positives.
By direct plating	373	59	314	161	17
By brilliant green and telluric acid	120	39	81	45	21

In no single case did we obtain pure growths by direct plating; they were always mixed. By the brilliant green method there were pure growths of colourless colonies in 62 cases. In no single case by direct plating was the plate sterile, whereas 50 per cent. of plates by the indirect method showed no growth whatever. This means an enormous saving of time. When the growth on the indirect plate was mixed, the colourless colonies generally preponderated, and in all cases were easily detected. By the direct method the final test of agglutination had to be done on 161 cases, with a positive result, so far as typhoid-paratyphoid bacilli were concerned, in 17 cases, while, on the other hand, only 45 cases had to be carried to agglutination, with positive results in 21, in the case of the indirect method. By the direct method 6 cases of dysentery organisms were found in addition to these, whereas only one was discovered by the brilliant green method, for dysentery bacilli are apt to be killed off by brilliant green.

On referring to the specimen index we found that the 1,023 specimens were provided by 622 individuals. There were two cases of typhoid carriers in the lot. Typhoid bacilli were picked out on all of five occasions by the brilliant green method, and on four occasions by the direct plate. Paratyphoid A bacillus was picked out on the single occasion by both methods. Paratyphoid B bacilli were isolated on fifteen occasions by brilliant green and on twelve occasions by the direct plate; but this only gives one side of the picture, for it happened that no less than five paratyphoid B carriers were detected by brilliant green which were altogether missed by the direct method, whilst, on the other hand, two carriers were found by the latter method and missed by the former.

For the isolation of typhoid-paratyphoid organisms from urine I tried a slight modification of the method in 1,100 specimens. Equal quantities of urine and brilliant green peptone water (the dye being in a concentration of 1 in 100,000 in the latter) were mixed and incubated for twenty-four hours, and a loopful from each was spread on MacConkey plates. In only one case was an organism of the group isolated—a paratyphoid A. In almost all other cases the plates were sterile. The test was of no great value because it was uncontrolled, and no care had been taken to ensure the proper reaction of the composite medium. But I am enabled by the courtesy of my colleague, Dr. T. H. C. Benians, to give a short but striking experiment in favour of the value of the method. He took the urine of a carrier in which *B. paratyphosus* A and *B. coli* could be demonstrated by straight plates, and added portions of this urine to fifteen other urines in the proportion of 1 to 10. To a parallel series he added brilliant green in a concentration of 1 in 250,000. After twenty-four hours' incubation plates were spread, with the result that by the direct method in only one case was the paratyphoid organism recovered, though *B. coli* were found in abundance on all plates, whilst by the interposition of brilliant green he found the paratyphoid organisms in nine cases in practically pure culture.

The method of Browning, Gilmour, and Mackie is therefore a useful method in detecting a number of carriers of typhoid-paratyphoid that are liable to be overlooked by the ordinary procedure. Both methods should be done together as a check on each other. Owing to the saving of time, if one method alone has to be used it should be the brilliant green.

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THE LOCAL TREATMENT OF BURNS ON A NAVAL HOSPITAL SHIP.

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THESE remarks refer to cases which have been under my care while afloat. They numbered 28, and were received (*a*) immediately after the *Natal* explosion, and (*b*) about forty-eight hours after the recent Jutland naval battle. The first application to the burn in every case was the Service picric acid dressing.

Out of the 28 cases, 15 were aseptic, and all these recovered. The remaining 13 cases were septic to a greater or lesser degree, and 5 of them succumbed, but one of these had other serious injuries. Four of the cases from H.M.S. *Natal* were virulently septic, and the two fatal cases developed erysipelas. I attributed this acute sepsis to the patients' immersion in water containing oil and sewage which had escaped from the sinking ship.

PLAN OF TREATMENT.

The treatment employed in my wards was as follows:

1. The blisters were punctured and the contents drained under strict antiseptic precautions, the surface being first sponged with carbolic acid solution, 1 in 20.

2. If it was a recent burn (for example, cases from H.M.S. *Natal*), I applied the Service picric acid dressing as the first dressing.

3. I smelt the dressings at my morning and evening duty rounds. Early sepsis in burns has an unmistakable odour, and the sense of smell can detect it early.

4. If there was no smell the first dressing was left on for two days, when it was removed in order to puncture any further blisters which might have formed. An ointment was applied, made of equal parts of boric ointment and vaseline. This was plentifully spread on strips of white "surgeons' lint," and was changed once daily. It is a good dressing, which does not tend to adhere, and so is not a painful procedure.

5. If the dressing had the septic smell the infected part was fomented with boric fomentations every four hours. The fomentation was four-ply, and the covering jaconet projected for ½ in. beyond the margins of the fotus in order to keep in the moisture. When the area cleared up—that is, when all sloughs, etc., had separated and a clean surface was left—the above-mentioned ointment was similarly applied once a day, according to the amount of pus which had been secreted from the raw surface.

6. If the burn was aseptic the loose skin of the blisters was *not* removed, but was left to act as a protection to the exposed deeper and painful layer of the skin.

7. If the burn was septic all loose skin was cut away; under these conditions the skin harbours harmful toxins which are readily absorbed to the detriment of the patient.

8. The dressing next to the skin was covered by alembroth wool, which contains a small amount of antiseptic (mercury perchloride), sufficient to prevent multiplication of any organism the wound discharges. The whole dressing was fixed by a bandage loosely applied.

9. Face masks were not used except when a fomentation was required. With face burns the nose, cheeks, and lips were frequently smeared with the ointment, which was gently massaged in with the convex surface of a teaspoon.

As prevention is much easier than cure, the greatest possible care was taken to prevent any infection of the burn wound, and the precautions particularly applied to a wound which was already septic. The vitality of such a patient is low, and his vitality is still further reduced by the continued absorption of the toxins formed by the septic bacteria. The exposed deep layers of the skin absorb toxins with avidity; until the septic sloughs have separated, and the infected area is quite clean, this absorption continues to occur, thereby seriously exhausting the patient's strength. If sepsis was present every effort was made to eliminate it as quickly as possible. If the patient can be kept going until this has occurred, he will most probably ultimately recover. If a further infection is added by any act of surgical uncleanliness on the part of the surgeon, nursing sister, or sick berth steward, this in a large number of cases proves to be the last straw. The patient may succumb before the separation of the slough from the living tissue (that is, the elimination of the sepsis) can be effected. Therefore to neglect antiseptic precautions in the treatment of a burn is akin to soundly kicking a man who is down on his luck.

To prevent infection sterile india-rubber operation gloves were used for dressing the burns, and were changed for each case. Further, a bowl of 1 in 20 solution of carbolic acid was kept on the dressing bogey, and the gloved hands were constantly sluiced in this. No burn was ever exposed until the area had been isolated by towels wrung out in carbolic acid, 1 in 20 solution; these lay on a sheet of jaconet the same size as a towel. After finishing a dressing, the towels were folded up and used for the next case. The same towels sufficed for a large number of dressings. All blisters were opened and drained, under such antiseptic precautions. The person who applied a fomentation had first thoroughly washed his hands before doing this.

If I were suddenly inundated with a large number of burn cases I would provide, if possible, all persons who were to dress the wounds with smooth india-rubber gloves. Should circumstances prevent changing of the gloves between cases, the gloved hands would be constantly rinsed in carbolic acid, 1 in 20 solution. For practical purposes any organisms would be thus removed from the smooth surfaced glove.

REMARKS.

This small series well illustrates the fact that burns up to the third degree will heal immediately, provided they are protected from the air by a mild antiseptic dressing. This can take the form of (*a*) lint soaked in picric acid, (*b*) dry boracic lint with boracic powder, or (*c*) ointment either smeared on directly or spread on lint.

As a first covering for a recent burn the Service picric acid dressing is excellent, and can be quickly applied. When this dressing is removed in an aseptic case the skin presents a dry yellow crinkled surface, all loose skin being curled up.

Having once removed the picric acid dressing I never repeat it. My reasons are: (*a*) That a burn after the first forty-eight hours is more comfortable with an ointment dressing, and that the wound heals quicker; (*b*) the burnt area should be examined in order to empty any further blisters which have formed. To neglect the latter may mean that the coagulated serum becomes organized by vessels from the deeper layers of the skin, a most undesirable thing to happen.

The reason for using an ointment of equal parts of boric ointment and vaseline is that it gives a mild antiseptic ointment of excellent consistence for the purpose. Boric ointment by itself is too firm and lies on the skin in the form of uncomfortable hard flakes. Vaseline by itself melts too freely at the body temperature and becomes disseminated in the lint upon which it is spread.

Any dressing which adheres to the raw area is not a good one, as it is uncomfortable for the patient, and there is bleeding on its removal. A boracic fomentation is comfortable and is an excellent method of quickly cleaning up a septic burn. The fomentation should be renewed every four hours.

I did not use face masks excepting when fomentations to the face were required. I find a patient dislikes a mask intensely, and covering up his face has a depressing effect on him. More important still, with a face mask on it is impossible to treat efficiently the purulent conjunctivitis which was so frequent an occurrence in burns of the face; the eyes required irrigating at least every two hours.

The great value of the protection afforded by clothing was illustrated by the fact that in 22 out of 28 cases the head (including its junction with the neck and also the face), wrists, and hands were burnt. A mask should protect the face, while gloves should protect the hands. The gloves should have gauntlets, as two or three of my patients burnt on the arms were wearing coats at the time, and the flames had travelled up the sleeves.

The bandaging of the patients' limbs is a most important point. In the excitement of the battle it is easily forgotten that there is a great deal of oedema and swelling after burns. A bandage, even loosely applied, will soon become uncomfortably tight. This causes intense agony, and if left on too long will result in gangrene of the limb. Immediately the cases arrived in my wards (on June 2nd, 1916) I had all the bandages of the burn cases cut and left loose as they were until I was able to dress them. This gave great ease.

DESCRIPTION OF A FIRST DRESSING FOR BURNS.

I have thought out the question of a combined outer dressing with its fixation, and have made (and tried) one

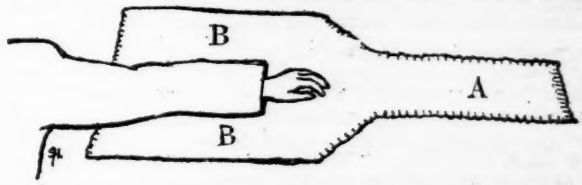

FIG. 1.—Showing the dressing laid out ready for use with an arm *in situ*.

which I will describe. It is simple, efficient, and comfortable. It can be quickly applied and changed. Most important of all, it does away with the real danger of gangrene, where the first dressing has from necessity to be left on for any length of time. It would be best made of an antiseptic wool (corrosive wood wool or alembroth) with a layer of gauze on either side after the manner of Gamgee tissue. If, after its application, the patient complained of pain due to tightness, any one near could loosen the offending tape—an easy matter compared with the finding of the actual point of constriction of a too tight roller bandage. It might prove a convenience to have this dressing packed up to contain a Service picric acid dressing. In case of necessity the whole would be ready for instant use.

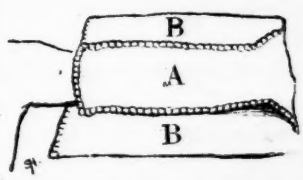

FIG. 2.—The portion marked A has been turned back to cover the limb; the side portions, marked B B, overlap A and are secured in this position by tapes.

The centre portion of the dressing upon which the arm rests should be made of thicker wool than the flaps A and B. (See Fig. 1.)

Fig. 1 shows the dressing laid out ready for use with an arm *in situ*. The portion marked A is turned back to cover the limb. The portions marked B overlap A, and are secured in this position with tapes.

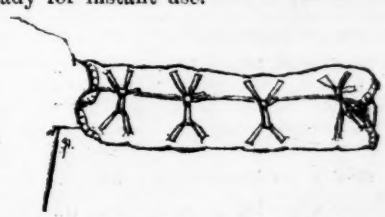

FIG. 3.—Showing the dressing made secure. Note the distribution of the fastening tapes.

Fig. 2 shows the flap A turned back.

Fig. 3 shows the dressing fixed by the tapes. It will be noted that the tapes cover a wide area and are sewn on far back in order to fix the whole bandage.

When finger cases were dressed care was taken to move the various joints passively before reapplying the dressing. Joints tend to get very stiff under overlying burns, and dangerously so if left unmoved for any length of time.

FIG. 4.—The dressing complete.

The patient holds his burnt hands and wrists in a position of flexion of the wrist with extension of the fingers. Any tendency to wrist-drop was countered by the application of a light splint (for example, poroplastic) to the palmar surface of the limb.

Only the treatment that was actually employed in the series has been detailed. For ordinary septic wounds, particularly where there is a cavity, I consider that eusol solution is deservedly popular; for septic burns, however, I prefer the hot boracic fomentations.

Lists of the cases treated in my wards are attached.

I am indebted to Surgeon Glover for the photographs from which the drawings have been made.

Burns up to the Third Degree.

No.	Situation of the Burns.	Degree of Burns.	Aseptic or Septic.	Result.
1	Head, wrists, hands	1st, 2nd, 3rd	Aseptic	Quickly healed.
2	Head, neck, wrists, hands	1st, 2nd, 3rd	,,	,, ,,
3	Face	1st, 2nd, 3rd	,,	,, ,,
4	Head, wrists, hands	1st, 2nd, 3rd	,,	,, ,,
5	Head, chest, wrists, hands	1st, 2nd, 3rd	,,	,, ,,
6	Head, wrists, hands	1st, 2nd, 3rd	,,	,, ,,
7	Face	1st, 2nd, 3rd	,,	,, ,,
8	Head, hand... ...	1st, 2nd, 3rd	,,	,, ,,
9	Head, wrists, hands	1st, 2nd, 3rd	,,	,, ,,
10	Wrists	1st, 2nd, 3rd	,,	,, ,,
11	Wrists	1st, 2nd, 3rd	Septic	Healing delayed, but did well.
12	Head, arms, hands	1st, 2nd, 3rd	Aseptic	Quickly healed.
13	Head	1st, 2nd, 3rd	,,	,, ,,
14	Head, hands, thighs	1st, 2nd, 3rd	Septic	Healing delayed, but did well.

Burns up to the Fourth Degree.

No.	Situation of the Burns.	Degree of Burns.	Aseptic or Septic.	Result.
15	Head, wrists, hands, leg	1st, 2nd, 3rd, 4th	Aseptic	Did well.
16	Face	1st, 2nd, 3rd, 4th	,,	,,
17	Head, hands ...	1st, 2nd, 3rd, 4th	,,	,,
18	Head, wrists, hands	1st, 2nd, 3rd, 4th	Septic	Healing delayed, would do well.
19	Head, wrists, hands	1st, 2nd, 3rd, 4th	,,	Healing delayed, would do well.
20	Head, arms, hands	1st, 2nd, 3rd, 4th	,,	Healing delayed, would do well.
21	Head, wrists, hands	1st, 2nd, 3rd, 4th	,,	Very ill when discharged, but he ultimately did well.
22	Head, wrists, hands	1st, 2nd, 3rd, 4th	,,	Healing delayed, would do well.
23	Head, wrists, hands	1st, 2nd, 3rd, 4th	,,	Healing delayed, would do well.
24	Head, wrists, hands	1st, 2nd, 3rd, 4th	,,	Died 4 days after action. Had other injuries.
25	Head, arms, hands	1st, 2nd, 3rd, 4th	,,	Died 4 days after action from acute sepsis.
26	Head, arms, hands	1st, 2nd, 3rd, 4th	,,	Died 7 days after action from acute sepsis.
27	Head, arms, legs ...	1st, 2nd, 3rd, 4th	,,	Died 11 days later from acute sepsis with erysipelas.
28	Head, arms, hands	1st, 2nd, 3rd, 4th	,,	Died 5 days later from acute sepsis with erysipelas.

CONCLUSIONS.

1. Of the 28 cases the burns were aseptic in 15. Five of the series died; in 4 of these the cause was acute sepsis.
2. The keynote of treatment is the prevention of sepsis. A burn must be regarded and must be treated with exactly the same care as is a fresh operation wound. Further sepsis, added to an already septic burn of the fourth degree and upwards, will probably kill the patient.
3. Picric acid as a first dressing is unrivalled.
4. For an aseptic case, equal parts of vaseline and boric ointment, plentifully spread upon white lint, makes a good, comfortable, and easily removed subsequent dressing.
5. Immediately a burn is known to be septic hot boracic fomentations should be begun.
6. Unless loosely applied a roller bandage put on at the first dressing will cause severe pain and it may lead to gangrene. To prevent this a new outside dressing is described.

ON THE EXTENSION TREATMENT OF GUNSHOT FRACTURES.

BY E. W. HEY GROVES, M.S., F.R.C.S.,

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IN reply to Mr. Aitken's criticism, in your issue of August 12th, of my address on the treatment of gunshot fractures, I would begin by thanking him for the fair and courteous tone of his remarks. Far from considering it a personal attack, I only welcome this or any other reasoned statement, which is much easier to meet than a mere appeal to the *ipse dixit* of dead or living authorities.

I have advised that full extension of a shattered limb should be postponed until active infection of the wound is at an end—that is, until there is evidence of readiness for repair. But this is only carried out in those grave cases where there is fear of gangrene or secondary haemorrhage. It does not involve any great distortion of the limb, so that remarks about kinks and twists of the vascular channels seem to me to have no bearing.

Now as to the mechanism of extension. I am sorry Mr. Aitken finds my physiology faulty, but I will, for the sake of argument, accept his own statements on this subject. We are agreed that there is a certain contractile force which tends to shorten a broken limb. The two practical points are: How can this force be overcome most effectively? and how can the correct length of limb be maintained most surely?

How can a Recent Fracture be Restored to Full Length?

The advocates of Thomas's teaching say that by simply pulling upon the limb, full length can be restored in a few moments and without anaesthetic or apparatus. With the utmost respect I say that I do not believe this, and I should like to see it demonstrated on any case of fractured femur which is about to be exposed for an open plating operation; but that such a fracture can be infallibly restored to full length or to over-extension by weight action has been proved over and over again.

One of the most striking instances of the difficulty of immediate lengthening of a limb as compared with the facility of slowly doing so, is afforded by the use of an extension apparatus which acts by two extending screws pushing apart transfixion pins driven through the two parts of the broken bone. When this double transfixion apparatus is applied either to the femur or the lower leg bones, and the extension screws twisted, a force of 200 lb. can be brought to bear, but I content myself with using 50 lb., at which point considerable resistance is found in further twisting the screws. But the next day, the screws can be twisted by the finger and thumb so as to get further extension, and by doing a little each day, full extension is easily obtained; this would have been impossible at the first sitting. This is exactly what Mr. Aitken himself describes as his own practice in many cases—that is, extension up to a certain point, followed by further extension on one or more subsequent days. But this is surely gradual extension, and it quite contradicts the idea that it is only necessary to pull harder than the muscles once and for all for full length to be obtained?

How is the Full Length to be Maintained?

The Thomas teaching is that it is easy to pull the leg to its full length, and equally easy to keep it there by tying it to the splint. But the two ends of the bone are not directly grasped by the splint, and all sorts of variations of tension are permitted by it. In the first place, the hold on the tuber ischii is shifted every time the skin over that promontory is attended to. Then it is shifted when the leg is raised for dressing purposes. If the leg is lifted until the knee is 9 in. from the bed, the distance of the knee from the tuber ischii is increased by 1 in., that is, the adjustment of a fracture which originally had 2 in. shortening is varied by 50 per cent. When the slings are removed from under the thigh, the tension is increased by the weight of the sagging limb tied by its two ends. And lastly, there is the stretching or slipping of the plaster attachment to add a fourth element of variability to the extending force. If, instead of tying the limb to a rigid bar, it is pulled upon by a constant weight of 15 lb., all these variations are done away with. The pelvis is tied to the top of the bed by a perineal band round the sound thigh, and the leg is slung off the bed. Then there is always 15 lb. extension, whether the buttocks are moved or whether the leg is elevated, or whether the slings are removed for dressing.

I would protest against the Thomas system being described as constant extension and the weight pull as intermittent. Such a statement is simply begging the question. How can a system be described as constant extension when it is subject to five distinct variations? First, the extension is often not done all at one sitting, but added to by tightening the straps day by day. Secondly, it is altered when the thigh ring is moved from its purchase on the pelvis for cleaning purposes; thirdly, it is altered whenever the leg is lifted and the ring leaves the tuber ischii; fourthly, it is altered whenever the dressing slings are undone; and fifthly, it is altered if ever the plaster stretches or slips.

On the other hand, if extension be by a weight acting through a cord running over a pulley, how can this be intermittent? If the man moves down the bed or up the bed the weight moves with him, but its pull does not vary, neither does its direction. Slipping or stretching of the attachment does not vary the weight or the extension.

It is stated by the Thomas school that there is less tension on a limb extended to its full length and held by a rigid splint than when it is held at the same length by a weight; and, further, that when the weight is used the tension varies. Now, both these statements are without proof. I know, when once a femur has been pulled down to its full length by a weight of 15 lb., that 10 lb. is enough to maintain this length. But what is the tension on the straps of a Thomas splint when the leg is at full length? I cannot say, because I have never seen this condition obtained, but if 10 lb. is needed to balance a contractile force, when applied by weight, is not this a measure of the tension which must be exerted by the fixed system? Again, the tension required by the Thomas system is greater than that employed by a weight with the knee semiflexed, because the Thomas splint has to overcome the maximum tension of the hamstring muscles, whereas in the cradle, the knee being bent, these muscles are out of action.

As to the tension in the weight system varying, I have already shown that it cannot be either more or less than that of the extending weight. But it may be said that the muscles spasmodically contract. If this were so, then with the same extending force the length of the leg would be constantly altering. But the weight remains the same, the tension remains the same, and the length of the leg remains the same.

I cannot accept Mr. Aitken's suggestion that his quoting a single case is a satisfactory answer to my objections. I do not doubt for a moment that Mr. Aitken could bring forward many brilliant results obtained by the use of a Thomas splint in his hands as used for fractured femur. I believe that even I could obtain good results from it. But why should one use a system which requires a splint to be fitted for each patient and which then has no less than five variables tending to failure when one has at hand a simple and constant system with none of these drawbacks?

I ought also to have mentioned the fact that whilst the Thomas splint imposes rigidity upon the knee, the weight system allows this joint to be exercised throughout the treatment.

Mr. Aitken speaks of my using great weights, weights up to 25 lb. But I only use such a weight for an old fracture, for which Mr. Aitken employs pulley blocks, giving, I suppose, over 100 lb., and then he repeats the employment of this "great weight" on several occasions. I never use more than 25 lb., and this very rarely; 15 lb. is the routine weight for recent fractures, and it is reduced to 10 lb. within a week. But, apart from all theoretical considerations, it is urged that weight extension is a constantly painful process as compared with the Thomas splint. I can only meet this with a direct negative, and my proof is close at hand. I have now a considerable number of cases of fractured femurs under treatment by weight extension, and all of them had a preliminary trial of a Thomas splint. I most cordially invite Mr. Aitken to visit these patients and ask them for an expression of their experiences. In the meantime let me simply state that the idea of "reflex starting pains" is quite mythical.

The Thomas Splint.—All advocates of Thomas's splint for fractured femurs lay great stress upon the point that the ring should fit the patient's thigh so that it rides snugly upon the tuber ischii instead of lying across the perineum. Now this is a fatal objection to its routine use in military surgery. The splints cannot be fitted to the patients at casualty clearing stations, and it is, I think, a matter of common observation that what is done is to use a size which fits no one, that is, a size of ring much too large. In one case which I know, in which the ring fitted originally, the splint had to be removed under an anaesthetic, owing to the fact that the limb had swollen subsequent to its application.

In conclusion, I would cordially endorse the spirit of Mr. Aitken's article, which he opens by saying that we are all concerned chiefly in helping to find the best methods of treatment, and not in making attacks upon one another. The results of weight extension treatment have been recorded with the fullest details by many surgeons. For example, by Bardenheuer, by the authors of the Balkan splint, and in the present war by myself, among others. May I, with the utmost respect, ask some advocate of the Thomas splint to do the same? Thomas's pioneer work was done before the discovery of the *x* rays, and I venture to suggest that if, after this discovery, any advocate of his system had proved by radiography that a large proportion of good results had been obtained by it, it would not have lapsed into being regarded by most surgeons as an obsolete and unsatisfactory method. But now, when the Thomas splint is being used by the thousand, there is ample opportunity for this demonstration. I would urge any surgeon who believes in this method to publish one hundred, fifty, or even ten consecutive unselected cases, illustrated by skiagrams, to show us what are the results obtained.

THE MECHANISM OF SALINE DRESSINGS.*

BY

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SINCE the onset of the war the publications of Sir Almroth Wright on the use of saline solutions for dressings[1] have caused a secession of many of the adherents of the old antiseptic school. This is partly due to the disappointing results obtained by the use of antiseptics and the failure to sterilize wounds by this method; for a greater success has been expected by the surgeons from their experience in civil practice.

The new treatment has come into very extensive use in England and in France, but there has been little discussion of the theoretical and experimental evidence indicating its use as a dressing for wounds, with the exception of the publications of its chief advocate, Sir Almroth Wright.

According to the recent publications of Sir Almroth Wright, the activity of salt solutions depends on their "phylacagogic" character—that is, their capability of "bringing the protective elements of the body, blood

* From the laboratories of the Robert Walton Goelet Research Fund.

fluids and leucocytes, into application in the wounds." Strong and weak salt solutions are included in these dressings, and their action varies according to the salt concentration.

WHAT IS CLAIMED FOR SALINE DRESSINGS.

A. *Hypertonic saline** is termed a "lymphagogic agent," and the mechanism of its action is described under the three phases of "physical action," "physiological action," and "the effect on the condition of the wound and microbial infection."

The physical action is stated to be chiefly a process of diffusion. It is stated that by this action water and albuminous substances are attracted to the surface of the wound. The statement is made that there is nothing in the wound like an animal membrane to filter out albuminous substances, and that therefore the laws of osmosis do not apply.

The physiological action of strong salt solution is described as bringing about the disintegration of leucocytes and the liberation of trypsin, which process permits autodigestion. This furnishes a medium favourable for bacterial growth as soon as the excess of salt is removed. Strong salt solution is said, further, to paralyse or repel the leucocytes by exerting a negative chemio-taxis.

The effect on the condition of the wound and microbial infection is stated to be due to a combination of the physical action and the physiological action, and also the inhibitory effect exerted directly on the pyogenic organisms themselves by the 5 per cent. salt solution.

As a result of the physical and physiological action, the autodigestion of sloughs is said to be expedited in the wound, and they are assumed to be readily loosened from living tissue by the outward current of "blood fluids."

B. The action of *physiological saline* is then described. This is stated to be physiological only in its tonicity or total content of crystalloids. There is, of course, more sodium chloride in it than in the blood, and sodium chloride will pass into the tissues in exchange for other salts which will pass out. This is presumed to be the cause of its "leucocytagogic" action.

DISCUSSION OF CLAIMS FOR SALINE DRESSINGS.

Is Sir Almroth Wright's hypothesis that "neither in the earliest stage of the wound where the tissues lie exposed, nor yet in the later stage, when the walls are infiltrated, have we in the wound anything in the nature of a membrane which could filter out albuminous substances"[2] correct? In his interesting little book on *Wound Infections* (1915) we find the statement: "Granulation tissue is composed of continuous layers of cells." Also "The cell wall is a quasi-impenetrable membrane" (p. 58). This sounds much like the description of an osmotic membrane. Apparently it was at that time so considered, for a little further on (p. 71) the statement is made: "Five per cent. solution of common salt mixed with one-half per cent. of sodium citrate . . . brings into play *osmotic* forces and 'draws' the lymph out of the walls of the wound." We are left in some doubt as to whether the principles of osmosis are held to apply or not to apply to the action of salt solutions on wounds.

Where do the bactericidal constituents of the discharge come from? We cannot consider the action of salt solutions on the tissues *en masse*. We must consider the action on the individual cells, each with its semi-permeable cell wall, as well as the action on the free fluids circulating between the cells.

It seems not unreasonable to assume that the bulk of the body fluids in the neighbourhood of the wound must be within intact cells or intact blood and lymph vessels, and only a comparatively small amount present in ruptured cells or cut intercellular spaces and lymphatics. Therefore it appears that we must have to deal with the laws affecting the passage of fluids through an animal membrane (osmosis) as well as with the laws affecting the interchange between fluids in free contact (diffusion). In addition, we must consider how the physiological activity (secretion) of the cells is acted upon by the dressing.

1. *What is Effected by Osmosis?*

If we cannot eliminate the process of osmosis as one of the physical reactions between the tissues and salt solutions, we must see what can be expected of it in the case of salt solutions of various strengths.

As far as there is an interchange of soluble bodies between the great mass of *individual cells*, including the endothelium of blood and lymph vessels, and a dressing solution, it is governed by the laws of osmosis or secretion.

A dressing containing only sodium chloride and water is *hypo*tonic for the albuminous substances, among which are the antibacterial agents of the body. No alteration in the concentration of the salt will alter the fact that there is a tendency toward the attraction of water by these substances into the cells, and a tendency for the same substances to osmose into the protein-free salt solution. Since, however, their osmotic motion is almost entirely restrained by the semi-permeable cell wall, their osmotic pressure results chiefly in attracting water. As far as they do pass through the cell wall in response to differences in osmotic pressures, they do so equally, no matter what the salt concentration, there being no albuminous substances in the dressing solution to exert a counter pressure for these substances in the cells.

Colloids and gells may attract and retain water from a saturated salt solution. Presumably those in the cells may do the same from 5 per cent. saline. The balance of water in the tissues depends, therefore, as far as the laws of osmosis are concerned, on the relative amount *ex*tracted by the salts in the dressing solution and *at*tracted by the albuminous substances retained within the cells.

Now, the rate of osmosis of water and salt through an animal membrane such as the cell wall is proportionate to the difference of their concentrations on the two sides of that membrane. There will therefore be a rapid extraction of water and inward migration of NaCl at first. The *rate* of interchange will decrease until the difference between the concentration of salt outside and inside of the cell is equal to the difference between the concentration of salt inside the cell and in the blood and lymph by which the salt is carried away. If the dressing solution is kept at a constant concentration and the blood and lymph circulation is sufficient to carry off salt as fast as it passes into it, a point will be reached where a stable maximum concentration of salt is established within the cell with a uniform rate of migration of salt through the cell from dressing solution to blood stream and a uniform rate of passage of water outward. This concentration point will be midway between that of the dressing solution and that of the blood.†

At this point, however, the attraction of the albuminous substances for water will be exerted, and the cells will attract water to satisfy their separate, positive osmotic pressure. Regulated by the same law which governs the rate of interchange between salt and water, the water will (at first) pass into the cell and on into the blood at rates proportionate to the differences between the protein content of the dressing solution and of the cell, and between the protein content of the cell and that of the blood stream. Since the protein content of the cell cannot easily escape (albuminous substances osmose only very slowly through an animal membrane), this balance is established when the protein concentration in the cell becomes one-half that of the blood—that is, when the amount of water in the cell is doubled. The body fluids and the dressing solution may be considered as unchanging solutions, since their constant renewal prevents any

* Since this paper was sent for publication "A Memorandum on the Treatment of Wounds by Physiological Methods" (Sir Almroth Wright, BRITISH MEDICAL JOURNAL, June 3rd, 1916) has appeared, in which the previous claim of the stimulation of tryptic digestion by hypertonic saline is apparently abandoned, and an inhibiting effect admitted. The oedema which may result from the accumulation of salt in the granulations is also mentioned, and the previously emphasized conception of the drawing power of salt for albuminous substances, except in so far as they are brought along with the current of water, is apparently dropped.

[Dr. Kenneth Taylor's paper was received for publication on May 22nd, 1916.]

† It may be desired to find the theoretical concentration of NaCl in the cell as far as the laws of osmosis apply. If the NaCl concentration of the dressing solution be represented by S, that of the blood by B, and that of the intermediate cell by C, the ultimate maximum NaCl concentration in the cell may be expressed by the formula $C=\frac{S+B}{2}$. In the case of continued application of 5 per cent. NaCl solution this will be about $\frac{5+0.6}{2}$, or 2.8 per cent.; with "physiological" saline solution $\frac{0.8+0.6}{2}$, or 0.7 per cent.; with salt free solutions $\frac{0+0.6}{2}$, or 0.3 per cent.

alteration in character. The variations will occur in the substances within the restraining membrane of the cell wall. In the following formulae A represents the albuminous substances present in approximately equal concentration in the circulating body fluids and within the cells. The arrows represent the direction of migration of each substance—the larger arrows the more rapid, the smaller the slower migration. Arrows of equal size represent migration at equal rates. The relative concentrations of each substance, when the dressing solution is first applied, are shown by the signs $> = <$. The "established reaction" represents the arrival at a stage when the concentration of the intracellular constituents will no longer vary unless the constitution of the body fluids or the dressing solution be altered.

	Body Fluids.	Cell Fluids.	Dressing Solutions.
1. *Hypertonic Saline.*			
Before reaction ...	H_2O	H_2O	H_2O
	NaCl =	NaCl	< NaCl
	A =	A	H_2O
Beginning reaction ...	$H_2O \rightarrow$	H_2O	$\rightarrow H_2O$
	NaCl $\leftarrow$	NaCl	$\leftarrow$ NaCl
	A	A	$\leftarrow H_2O$
Established reaction ...	$H_2O \rightarrow$	H_2O	$\rightarrow H_2O$
	NaCl $\leftarrow$	$NaCl - H_2O$	$\leftarrow$ NaCl
	A	$A + H_2O$	$\leftarrow H_2O$
2. *Isotonic Saline.*			
Before reaction ...	H_2O	H_2O	H_2O
	NaCl =	NaCl	= NaCl
	A =	A	H_2O
Beginning reaction ...	H_2O	H_2O	H_2O
	NaCl =	NaCl	= NaCl
	A $\leftarrow$	A	$\leftarrow H_2O$
Established reaction ...	$H_2O \leftarrow$	H_2O	H_2O
	NaCl =	NaCl	= NaCl
	A	$A + H_2O$	$\leftarrow H_2O$
3. *Hypotonic Saline.*			
Before reaction ...	H_2O	H_2O	H_2O
	NaCl =	NaCl	> NaCl
	A =	A	H_2O
Beginning reaction ...	$H_2O \leftarrow$	H_2O	$\leftarrow H_2O$
	NaCl $\rightarrow$	NaCl	$\rightarrow$ NaCl
	A	A	$\leftarrow H_2O$
Established reaction ...	$H_2O \leftarrow$	H_2O	$\leftarrow H_2O$
	NaCl $\rightarrow$	$NaCl + H_2O$	$\rightarrow$ NaCl
	A	$A + H_2O$	$\leftarrow H_2O$

The chief result to be anticipated in a hypertonic saline dressing is, therefore, an ultimate increase of NaCl and water within the cell. If at any point the hypertonic solution be removed or replaced by iso- or hypo-tonic solutions, an additional inrush of water will occur from the dressing solution and body fluids to satisfy the excess of salt deposited.

By applying the same laws to the case of isotonic saline, it becomes evident that it is chiefly the osmotic pressure of the albuminous substances which is exerted, and which will result in an increase of water within the cell. There should be a little increase of the NaCl concentration due to its slight excess in the dressing solution.

In the case of hypotonic solutions, the positive pressure of both the NaCl and the albuminous substances will be active, with a more rapid inrush of water and a gradual extraction of the salt.

Thus the end result of the prolonged use of any protein-free watery solution will be an increase of water within the cell—early in the use of the hypotonic saline, later with the hypertonic solutions. Any great increase in concentration of NaCl in the cell due to the hypertonic, and also a diminished concentration due to the hypotonic, can, together with the watering of the protein content, only serve to check or permanently inhibit its physiological response to the stimulus of the injury and the infection.

No increase in albuminous bactericidal substances in the wound is to be expected from the process of osmosis. It is useless to attempt to influence the osmotic motion of albuminous substances by increasing the salt content of the dressing solution. They will osmose very slightly in any case, but in so far as such osmotic motion occurs it will take place just as rapidly into weak as into strong salt solution. Hypertonic saline is not a "lymphagogic" but a hydrogogic agent.

2. *What is Effected by Diffusion?*

Sir Almroth Wright does not admit that the great mass of intact cells is affected in any way by the use of saline solutions. He apparently does not consider the exchange of salts and water through the endothelial cells of the blood vessels and lymph channels to be subject to the laws of osmosis. The "lymphagogic" action he assumes to be entirely a process of diffusion.

Now we know of no physical law from which it may be deduced that NaCl exerts a positive attraction for albuminous substances. In fact, it has been demonstrated in this laboratory by Mr. H. E. Magee that when a weak saline solution of egg albumen is brought into direct contact with solutions of NaCl no greater migration occurs into 5 or 10 per cent. salt solution than into physiological saline. When the albumen was incorporated into agar, allowed to set, and saline solutions of various concentrations superimposed, the same results were obtained except in the case of saturated NaCl solution. In the latter, albuminous substances appeared in greater amounts than in the 0.85 per cent., 5 per cent., and 10 per cent. solutions, probably due to the obvious shrinkage of the agar and the *expression* of its content.

When two solutions are in direct contact and there is no selective animal membrane between them, no more restraint is placed upon the movement of salts and colloids than upon the movement of water. The interchange must take place without inducing, in the fluids, any current which might bring with it albuminous substances.

Of course there is a natural diffusion of these substances into any solution which contains them in lesser concentration. The proportion of NaCl is immaterial. It is only the proportion of albuminous substances which counts.

Sir Almroth Wright places considerable confidence in what he terms the "physiological action" of the hypertonic solution when applied to the wound. The solution is admitted to produce certain undesirable results in the wound. It is said to repel the leucocytes in the neighbouring tissues. It is said to break up those in the surface of the wound. This disintegration of leucocytes (and other cells?) frees trypsin, which is admitted to digest ("corrupt") the lymph in the discharge, making it a favourable medium for bacterial growth. The rapid multiplication of bacteria is assumed, however, to be inhibited by the antiseptic action of the strong saline.

The digestion of the sloughs by the trypsin is claimed to proceed, causing their rapid separation. It is assumed that trypsin will act in 5 per cent. saline. This concentration is sufficient to markedly reduce its action *in vitro*. Many ferments are inhibited by an excess of NaCl. We have found in a series of *in vitro* experiments that peptic digestion proceeds rapidly in 0.85 NaCl solution, a little more slowly in weaker salt solutions, and is almost entirely suppressed in 2.5 NaCl solution. Tryptic digestion we found to be most active in the weak salt solutions, to fall off rapidly in solutions of over 1 per cent., and to be almost completely suppressed in 5 per cent. concentrations. The only remaining physiological action with which the hypertonic solution is accredited is, then, that of breaking up and "paralysing or repelling the leucocytes." It is reasonable to assume, however, that considerable interference in the vital processes of the cells will occur as a result of the marked alteration in their salt and water content. It is unsafe to assume that such antibacterial albuminous bodies as may be present in the discharge retain their activity in a menstruum of 5 per cent. NaCl.

As to the beneficial action of 5 per cent. NaCl as a very weak antiseptic, there is no dispute.

3. *What is Effected by Secretion?*

It appears to us that little increase in the discharge of bactericidal substances can be expected as a result of osmosis and diffusion. Is not the greater part of the antibacterial substances *secreted* by the cell in its reaction to irritation by specific substances? Increased secretion of albuminous substances is one of the chief phenomena of inflammation. It is probably to this process that we must look for the source of most of our antibacterial agents. We must be careful not to interfere with this reaction by too great alteration of the salt content of the tissues.

SUMMARY.

(*a*) What, then, may be expected from the use of a strong salt solution in a wound?

By a process of osmosis water is extracted from intact cells, blood vessels, and closed lymph spaces. The same interaction increases the NaCl content of intact cells and those lymph spaces which may be slowly drained. When the strong salt solution is diluted or withheld, a rapid increase of water within the cells is to be anticipated. If continued for a long period, the colloid constituents of the cells imbibe water and the basis of oedema is established. A small amount of dialysable albuminous substances will emigrate from the cells, due to the absence of such substances in the dressing solution. This emigration will be unaffected by the NaCl concentration of the solution.

By a process of diffusion an interchange of NaCl and water will occur between the free fluids in the intercellular spaces and cut lymph channels which are in contact with the dressing solution, resulting in a concentration of the salt in these fluids.

At the same time a slow diffusion outward of all soluble proteins and other bodies (with the exception of NaCl) will occur, due to their absence in the dressing solution. Again, the NaCl concentration will not affect the rate of diffusion of these substances, nor will an outward *current* be produced by the interchange of NaCl and water and thus carry with it the free lymph. There remains the normally brisk reaction of secretion upon which we have to fall back for the desirable increase in antibacterial substances. This may be seriously inhibited by the excess of NaCl in the cells.

The migration of leucocytes will be checked and those on the surface of the wound probably destroyed.

The tryptic digestion of sloughs will be suppressed.

The character of the antibacterial substances secreted or diffusing into the wound may possibly be so altered as to become inactive by their dilution and solution in strong salt solution. The activity of the bacteria may be slightly reduced by the antiseptic action of NaCl in concentrations of 5 per cent. or more.

(*b*) What is to be expected from "physiological saline"?

The amount of osmosis is negligible as far as the interchange of NaCl and H_2O is concerned; there will be only a slight increase in the NaCl content of the cells. There will, however, be the same positive osmotic pressure of the albuminous substances within the cells resulting in the attraction of water. Therefore the waterlogging of the tissues will occur if the solution be used for a long period.

The process of diffusion will allow of an equal outward movement of soluble proteins as in the case of hypertonic saline solution.

The secretion of the cells will proceed without serious interference by the dressing solution until the gradual accumulation of water diminishes their power of reacting.

The migration of the leucocytes will proceed normally or be increased and their beneficial activities remain unaltered.

The tryptic digestion and dissolution of the sloughs in the wound will proceed at its maximum rate, free from the inhibition of strong salt solution.

The character of the antibacterial albuminous substances, diffusing or being secreted in the surface of the wound, will be unaltered.

(*c*) What is to be expected from hypotonic saline?

By the process of osmosis the combined positive osmotic pressure of the salts and proteins within the cells will be exerted. The result will be a rapid extraction of salts from the cell, and a rapid accumulation of water, with the early establishment of a waterlogged condition.

The process of diffusion will allow of an equal outward movement of soluble proteins as in the case of hypertonic and isotonic solutions. In addition, there will be a similar emigration of NaCl. The secretion by the cells will be interfered with as a result of the extraction of salts and the rapid accumulation of water. The migration of leucocytes will be checked.

The tryptic digestion of the sloughs will proceed a little more slowly than with isotonic solutions, but much more rapidly than with hypertonic.

The character of the antibacterial substances will probably be altered, and possibly be rendered inactive by dilution and solution in an abnormal menstruum.

CLINICAL EVIDENCE.

What clinical evidence is there of the success of the treatment with hypertonic salt dressings? Aside from the claims of its author, there have been scattered reports in its favour appearing in various medical journals. There is also a strong minority which is disappointed in the treatment. It is claimed that the infection is not diminished and that the wound is left in poorer condition by its use than would have been the case if it had been left alone. Attempts are made to reinforce the weak antiseptic action of the high NaCl content by the addition of a more active germicide. This is merely additional evidence that it has proved unsatisfactory.

We have seen it used rather extensively, and have not been convinced that it produced the results claimed for it. The saprophytic bacterial flora persisted quite as long as with the ordinary methods of antiseptic treatment, and the separation of sloughs did not appear to be appreciably hastened. We have, in addition, felt that oedema of the tissues around the wound occurred more frequently after the use of hypertonic saline than with other dressing solutions, possibly as the result of an increased deposit of salt. Furthermore, the recuperative reaction in the wound appeared to be retarded.

CONCLUSION.

The clinical superiority of the treatment by hypertonic saline dressings does not appear to be so decisive that the theoretical and experimental objections to their use can be disregarded.

The theoretical indications for the use of salt solutions appear to be based on an untenable hypothesis of the structure of the tissues about the wound, and an erroneous interpretation of physical and physiological laws.

Certain characters possessed by hypertonic NaCl solution are theoretically undesirable in a dressing solution, and their harmful action can be demonstrated experimentally and clinically.

Certain desirable results claimed to be effected by the use of hypertonic NaCl dressings cannot be demonstrated *in vitro*.

The chief beneficial character held by strong salt solutions, aside from the cleansing property possessed by all watery solutions, is their mild antiseptic action.

A detailed investigation of the specific character of special antiseptics may be a more profitable undertaking than an exclusive concentration upon the physical and physiological properties of sodium chloride.

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RECENT EPIDEMIC OUTBREAKS OF ACUTE POLIOMYELITIS.

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IT seems to be clearly established that acute poliomyelitis has only in comparatively recent years appeared in epidemic form. The first definite and clear reference in the literature to an epidemic outbreak occurs in 1881, when Bergenholtz recorded the occurrence of 18 cases in one district in Northern Sweden; but it was not until the appearance of Medin's well-known record of 43 cases in Stockholm in 1887 that attention was called to the subject. Since that time outbreaks have been more frequent and ever-increasing in extent. In 1899 Wickman reported 54 cases in Stockholm, and in the same year Leegaard described an outbreak, also of 54 cases, which had occurred at Bratsburg in Norway, between July and October. Wickman's excellent record of his observations in over 1,100 cases in Sweden in 1905–6, his accurate description of the various clinical types met with in that epidemic, and of the *post-mortem* findings in the fatal cases, mark a great advance in our knowledge of the disease. In the same years—1905–6—Norway also suffered severely, about 1,000 cases being reported.

In Germany small outbreaks had been reported from time to time since 1886; the first large outbreak there

* Abridged from a paper read before the society.

occurred in Westphalia in 1909, 700 cases being reported, and there were at least 1,000 cases in Germany in that year. About the same time outbreaks were reported from Austria, Holland, Switzerland, Russia, and Australia. In France reports of epidemic outbreaks began to appear in 1888, and gradually became more numerous. Netter reported 100 cases in Paris in 1909. Italy had much the same experience, and small outbreaks also occurred in Spain. America came in with a record of 38 cases in Massachusetts in 1892, and since then has had annual visitations of ever-increasing magnitude. Epidemics increased in number and extent until 1910, when, all over Europe and in the United States and Canada, the disease was very prevalent. Between the years 1907 and 1910 America had, according to Flexner, 23,000 reported cases, and it is estimated that at least 20 per cent. of the cases were not reported.

In the British Isles the first report of an epidemic outbreak was made in 1897 by Dr. Pasteur, who met with 7 cases in one family. Reports of small outbreaks then began to appear more frequently. The first large outbreak was reported by Parker of Bristol in 1909; there were 37 cases. In 1910, 34 cases were reported in Carlisle, 37 in Barrow, and it is known that quite a large number of cases occurred in the towns and rural districts in the North of England. In that same year—1910—quite an extensive epidemic occurred in Leicestershire and Nottingham, Bingham and Melton Mowbray districts being most affected. In this outbreak, as has so often been the case elsewhere, both in Europe and America, the true nature of the epidemic was not at first recognized. For a considerable time the cases were diagnosed as cerebro-spinal fever. This mistake was the more easily accounted for by the fact that the meningitic type was common, and that there occurred at the same time cases of true meningococcal meningitis in the city of Nottingham. In 1911 also there were many cases in England, and quite an extensive epidemic was reported from Devon and Cornwall. The exact number of cases in this outbreak is not definitely known, but it was certainly over 200. This epidemic was very severe and the mortality in it high. In this outbreak also the cases were at first reported as cerebro-spinal meningitis. In Scotland the records are few, but outbreaks have occurred. Low reported 62 cases in and near Edinburgh in 1910.

In Ireland, at least since 1909, cases have been more common, and many small outbreaks have been observed. In the autumn of 1911 there were many cases in Belfast and the neighbouring counties. It was again very prevalent in our own district in 1913. Severe localized outbreaks have occurred in several districts—mainly rural districts—throughout the country. The best known of these occurred at Coagh, co. Tyrone, mainly in the practice of Dr. Burgess, commencing in October, 1913. Dr. Burgess had within a few weeks thirty-seven cases in a comparatively sparsely populated country district. A few months later Dr. Burgess had a single house outbreak; in this house there were six cases of very virulent type, with four deaths. During the progress of this outbreak I had an opportunity of visiting the district with the late Dr. Brian O'Brien and Dr. Burgess, and of examining some seventeen or eighteen of these patients, then in all stages of the disease. At the same time as the Coagh outbreak some fourteen cases occurred in quick succession at Irvinestown. It is not possible to obtain anything like complete figures for Ireland. I am indebted to Dr. Bigger, of the Local Government Board, for a return of the cases reported to the Board since 1912. From that return it does not appear that, with the exception of these two instances, there has been any considerable localized outbreak.

Seasonal Prevalence.—Practically all these outbreaks have occurred in the late summer and autumn. Some variation is shown in the times at which the period of maximum intensity has been reached. In many instances it has been in August, at other times as late as October. In some places cases have continued to crop up all through the winter months.

Symptomatology.

In all these epidemics the clinical types met with have been similar. Wickman's main types are—

I. The *abortive* type, in which the prodromal symptoms are present, but which clears up quickly without any paralysis.

II. The *spinal* type. In this group is included a large percentage of the cases. It is characterized by the usual onset followed by paralysis, temporary or permanent, of the limbs or muscles of the trunk.

III. The *ascending* or *descending* type, fortunately a small group in which the paralysis generally begins in the lower limbs, less frequently in the arms, and gradually extends and involves the muscles of respiration, terminating in death after a few days' illness.

IV. The *bulbar* or *pontine* type, in which some of the cranial nerves are affected, frequently in conjunction with some involvement of the spinal centres.

V. The *cerebral* type in which changes occur in the cortex of the brain, giving rise to spastic hemiplegia or monoplegia.

VI. The *meningitic* type, in which the symptoms closely resemble those of cerebro-spinal fever, the pia mater being much involved. Netter found that 29 per cent. of his cases were of this variety.

Wickman also describes (*a*) an *ataxic* type, but it seems doubtful if this variety should not be classed with the bulbar and pontine cases; and (*b*) a *polyneuritic* type, which many writers think should be included in the "spinal" class.

The incubation period is said to be generally five to ten days, but many observers believe they have met with instances of much longer periods, and Wickman reports one in which he was satisfied it could not have been longer than one day.

Whatever the type, the onset is always much the same, varying only in severity: An initial rise of temperature, generally digestive disturbances with vomiting and occasionally diarrhoea, drowsiness, profuse sweating, irritability, marked hyperaesthesia, with pain and general tenderness. Wickman lays stress on the diagnostic value of (1) drowsiness, (2) pain and tenderness, (3) stiffness of the neck, and (4) profuse sweating. According to Müller the outstanding signs are (1) the profuse sweating, (2) the hyperaesthesia, and (3) leucopenia.

In the cases which occurred in our own neighbourhood in the last few years all Wickman's types were met with, and I have seen examples of them all. The spinal type was common; several showed involvement of the cranial nerves.

In 1909 I saw with Dr. Gaussen two cases in one family at Lambeg, children of 10 and 12 years; both had taken ill on the same day. When I saw them, on the morning of the fourth day of illness, one showed complete hemiplegia, was unconscious, with rapid breathing and a temperature of 104°, with drenching sweating. This child died a day or two later; this was a typical example of the cerebral type. The other had a comparatively mild attack of the *spinal* type with partial paralysis of both legs.

In the autumn of 1913 there were many cases in the city. At that time I saw with Dr. McLorinan four cases in one family; all had taken ill within a couple of days. When I first saw them two had comparatively mild attacks of *spinal* type—one with partial paralysis in both legs, the other with partial paralysis in one arm. Another was still very acute, showed profuse sweating, with high temperature, and very great tenderness all over, especially in the legs. The dread of being touched was so great that the child when any one approached the bed held itself quite rigid and gripped the mattress with a hand on each side; the sweating was so free as to drench the pillow and bed. There was no mental confusion. We inquired from the mother if the other members of the family were quite well; she told us that the youngest child, an infant of ten months, seemed dull but not really ill. On examining this infant we found it had a temperature of 101°, was rather apathetic, and had complete absence of knee-jerks. This child did not develop any further signs. The temperature next morning was normal, but the absence of the patellar reflex remained for some time. This I take to be a typical example of the *abortive* type.

At this time, when there were many cases of poliomyelitis occurring in the city, I saw two cases of "Landry's paralysis" within a fortnight. One was a powerfully-built man of 21 years who had taken ill with headache, general tenderness, and mild fever with some vomiting. The vomiting and headache cleared off but the temperature remained elevated without obvious cause. I saw him with Dr. Martin on the fifth day of his illness: he had that morning shown some weakness in his legs and had complete loss of patellar reflex. He was removed to Purdysburn Hospital. Next day there was complete paralysis of the legs; the paralysis quickly extended to the arms and later to the respiratory muscles, and he died from the respiratory paralysis on the ninth day. The other was a case of Dr. Burnside's, a boy of 15 years. In this case the paralysis had extended much more slowly. When I saw him the legs were completely paralysed and the arms almost so. He was unable

to swallow and there was great difficulty in respiration. He died the following day.

Of the *ataxic* type I have only met with one case. This case I saw with Dr. Rentoul in Lisburn. Two children in one family had been taken ill on the same day. One developed a very severe attack of the combined meningitic and spinal type with complete paralysis of both legs, which was permanent. The other, a boy of 7 years, after a short feverish attack with gastric disturbance lasting a couple of days, developed a very ataxic gait. When I saw him the fever had cleared up. In bed he appeared quite well and very bright. He showed complete loss of knee-jerks, and when stood upon the floor he was able to walk without assistance, but with a *very* staggering gait. There was then no pain or tenderness. He was most anxious to give exhibitions of this staggering, which he treated as a great joke. He was kept at rest in bed and the ataxia rapidly disappeared. The knee-jerks remained absent for a considerable time.

Landry's Paralysis.—The position of "Landry's paralysis" in relation to acute poliomyelitis has given rise to much writing. Strümpell had insisted from clinical observation that they were identical. Wickman satisfied himself from histological findings that this view is correct. Römer states that "Landry's paralysis is only infantile paralysis with a fatal issue." Zimmerman as early as 1885, from *post-mortem* evidences, came to the conclusion that "Landry's paralysis and infantile paralysis formed only different degrees of one and the same disease." Römer refers to Landry's paralysis as "poliomyelitis acutissma."

Second Attacks.—Second attacks have been reported by many observers, but appear to be very rare. They have also been experimentally produced in the monkey.

Case Mortality.

In examining the records it is impossible to avoid the conclusion that the figures are not always closely comparable. In some outbreaks the abortive cases appear to have been carefully looked for, in others to have been generally overlooked. Wickman found that the abortive cases in some outbreaks accounted for over 50 per cent. of the total cases. In most of the mortality tables the abortive cases are excluded, only those in which there was definite evidence of paralysis being counted. Then the case mortality has generally been between 10 per cent. and 30 per cent., though in some outbreaks it appears to have been considerably higher.

Case Mortality Recorded by Various Observers.

		Mortality.
Wickman	868 cases in Sweden in 1905	16.7%
Leegaard	577 cases in Norway in 1905	14.5%
Krause	633 cases in Westphalia in 1909	12.3%
Müller	100 cases in Hesse-Nassau in 1909	16 0%
Frost	150 cases in Cincinnati in 1911	30.7%
Frost	1108 cases in New York in 1912	16.5%
England:		
Reece	154 cases in Cornwall and Devon in 1911	22.1%
Farrar	74 cases in the Midlands in 1910	10.8%
Ireland:		
Burgess	37 cases in Coagh, co. Tyrone, in 1913-14	27.0%

Etiology.

Dr. Robb gave an account of the researches which led to the establishment of the fact that the infecting agent is a filter-passing organism, and proceeded as follows:

It was soon found that specific antibodies were present in the serum of humans and monkeys who had recovered from the disease. The blood serum from such cases when mixed with the virus destroys the infective power of the virus. The serum retains this power for a very long period. Netter records a case in which the blood serum was found to be still active after thirty-two years. By this test it has been possible to prove (1) that epidemics in different countries are due to the same infecting agent; (2) that sporadic cases and epidemic cases are due to the same cause; (3) that the "abortive" cases are true cases of poliomyelitis, and it is also of great value in settling the diagnosis in doubtful cases. It has the disadvantage of being very expensive, as two monkeys are required.

Immunization.—All attempts to find a method of immunizing monkeys have so far failed. (1) Inoculations with active virus in minute doses; (2) inoculations with dried virus; (3) inoculations with virus attenuated or killed by chemical agents; (4) inoculations with heated virus; (5) inoculations with mixtures of virus and serum containing antibodies. So far no method which is effective and free from danger has been found.

Serum Therapy.—At present there does not seem to be much prospect of the successful employment of serum therapy in poliomyelitis. Where monkeys are infected by intracerebral injection of the active virus, the giving at the same time of large doses of serum containing antibodies, either by the intravenous, intraspinal, or intraperitoneal route, produces no results. Even if such a method of treatment were efficacious the fact that the ordinary "serum animals" could not be made use of must prove a great difficulty. Attempts have been made to treat acute cases of the disease with the serum from human cases which have recovered from an attack. The BRITISH MEDICAL JOURNAL published recently a note of the employment of this method by Netter in 32 cases. The results are still doubtful.

Method of Spread.

Two main views on the method of transmission of the disease were for a time held: (1) That the disease is communicated by personal contact; and (2) that it is conveyed by insects, the stable-fly being held mainly responsible.

Rosenau, of Harvard, in 1912 reported that he had successfully transmitted the disease by allowing numbers of the stable-fly (*Stomoxys calcitrans*) first to feed on an infected monkey, and by then transferring them to a healthy monkey. Anderson and Frost, of Washington, also reported that they had conveyed the disease in this way; but many other observers, after careful and elaborate experiments, obtained completely negative results, and Anderson and Frost failed in all their attempts to repeat their experiment. The fact that only after the injection of *very large* doses of the active virus can the disease be produced when the intravenous route is employed also goes far to establish the improbability of biting insects being the means of spread. After an exhaustive inquiry the stable-fly has now left the court without this stain upon its character.

It is now generally accepted that the disease is spread by personal contact (1) by acute cases; (2) by abortive cases; (3) by chronic carriers; and (4) by healthy carriers. It has been proved that the active microbic agent is at times to be found in the nasal washings of all these classes, and it is generally believed that the disease is conveyed by the passage of this active agent from the upper respiratory tract of one individual to the upper respiratory tract of another. It is possible readily to infect monkeys by rubbing in the active virus to the *abraded* nasal mucous membrane. It has been long known that the disease spreads along routes of traffic, and that schools are often important factors in spreading the infection, and there is no doubt that should the disease appear in epidemic form in Belfast the picture palaces would be accused of helping in its dissemination, as they have been accused, perhaps with truth, of helping to keep alive our scarlatina.

General Measures for the Control of Epidemics.

The attack-rate in epidemic outbreaks of poliomyelitis is, as a rule, a low one; to this rule, it is true, there have been exceptions. For instance, in the outbreak in Nauru there were 700 cases in an island population of 2,500.

In England a step in the right direction was taken at the beginning of 1913, when the disease was made compulsorily notifiable. Scotland and Ireland followed, but with a shorter step, for in Scotland and Ireland it is left to the option of each sanitary area to adopt notification, or not to do so, as they may think advisable. This is much to be regretted, for only universal notification is of much value. With us in Belfast the disease has been notifiable for a couple of years.

In America isolation of the cases, and in some places also of the contacts, is the rule. In Vermont the acute cases are being isolated for a minimum period of six weeks, and all known contacts for two weeks.

Drug Treatment for Contacts.—It had been found by Flexner that the administration of large doses of urotropin to monkeys before giving to them an infective dose of the active virus modified the results. In some cases the attack was prevented altogether, in others the incubation period was increased from the normal, of five to eight days, up to twenty-four days, and the attack, if it occurred, was generally mild. Urotropin has been much prescribed for known contacts.

THREE CASES OF BUBONIC PLAGUE ARISING IN ENGLAND.

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As has been reported in the public press, two certain cases, and one probable, of bubonic plague have been treated at the Bristol Royal Infirmary.

The first was a lad, J., aged 16. He was admitted under my care on July 30th, sent in with a diagnosis of strangulated hernia. He had been well in the morning, went for a cycle ride, but was taken suddenly ill with pain in the right groin and vomiting. I saw him late at night. He was obviously very ill, pulse 126, temperature 103°, respirations 24. There was an intensely tender swollen lymphatic gland in the right groin, with nothing on the leg, genitals, or perineum to account for it. He was extensively flea-bitten.

I instructed my house-surgeon, Mr. Hayman, to make multiple incisions into the inflamed area around the gland, and passed him over to the care of my medical colleague, Dr. Edgeworth. My house-surgeon sent the cultures to Dr. Walker Hall for bacteriological examination, but it was not till two days afterwards that Mr. Hayman and I specially asked that plague bacilli should be looked for. Eventually they were found. The patient's further progress will probably be reported by others. He is now at a fever hospital, nearly well.

The second case, O., was a boy aged 10. He was admitted to my ward on August 1st with an inflamed gland in the right groin, a temperature of 103°, pulse 120, respirations 36. He did not look very ill. There was no obvious cause for the glandular inflammation. He had been laid up for one day previously. The temperature rapidly fell, the gland improved, and on August 5th he went home. This case has not been proved to be bubonic plague, and it would never have been suggested if it had not been that Dr. Edgeworth discovered that his father worked at the same factory as the lad J.

The third case was the one that definitely established the diagnosis, which in the other patients had been only a suspicion. A man, S., aged 23, was sent to my ward on August 5th diagnosed as appendicitis. He had been taken ill on the previous evening with pain in the right lower abdomen and groin, and had vomited four times. I saw him in the afternoon. He looked prostrate, restless, and anxious. The breathing was jerky, but not hurried. The temperature was 100°, pulse 96, respirations 24. There was great tenderness and rigidity in the right iliac fossa, but also an enlarged and tender gland in the right groin, with oedema round it, and no source in the leg, genitals, or perineum. He was covered with vermin.

After careful consideration I decided that, though it was probably plague, it was highly desirable to clinch the diagnosis by examining an excised gland, and as there was some possibility of its being appendicitis, and he had to have an anaesthetic anyhow, I explored and removed both the appendix and the gland. The appendix contained oxyurides, but was otherwise normal. The gland was soft, red, and swollen, and not suppurating. My house-surgeon stained a film, which we found full of bipolar bacilli. Dr. Walker Hall definitely established our diagnosis of plague a day or two later by cultural and animal inoculation experiments. The patient is recovering, but has a great sloughy hole in the groin (August 17th).

The patients S. and J., and the father of O., all work at a rag factory, full of rats and fleas, in a poor part of the city. No further cases have arisen, as far as I know, from August 5th till now (August 26th).

One can only speculate as to the source of the infection. No doubt further light will be thrown on this in due course. Plague bacilli have been demonstrated in a rat found dead in the factory. My own theories have been three:

(*a*) *Infection from the rags.* The patients, however, tell me that the rags do not come from abroad.
(*b*) *Infection carried by rats escaping from ships entering the port.*
(*c*) *Deliberate inoculation of city rats by an enemy.* If this last theory is correct, it is probable that other towns may have a visitation of rat plague, with human cases following.

Memoranda:

MEDICAL, SURGICAL, OBSTETRICAL.

ON THE USE OF PETROL FOR CLEANSING WOUNDS.

PETROL has been used for the first cleansing of wounds for over twenty years in the hospitals of Toronto, Canada, in their emergency wards in which accident cases are dressed; such cases include street, railroad, and machinery accidents, and have contused lacerated wounds with much dirt ground into them. Petrol has given excellent results in the cleaning of these wounds, probably through its fat-solvent action in removing tissue débris and particles of fatty tissue to which dirt clings, as well as dirt itself.

As wounds received at the front are contused, lacerated wounds, and come in a very dirty condition, it seemed worth while to try petrol in cleaning them; the method used in this field ambulance for the first cleansing of wounds is as follows:

The skin, and then the surface of the wound, is cleaned by vigorous rubbing with a swab of absorbent cotton soaked in petrol. Swabs of cotton are wound round an artery forceps or probe and soaked in petrol, and with them the wound is cleaned from the surface inwards as far as the forceps can be pushed. The forceps is rotated and pushed in all directions, a number of swabs being used, and the process is continued until a couple of swabs come out perfectly clean.

If there is much dried blood or gross dirt on the surface of the skin or wound, it is best removed with warm water and soap, and a brush if necessary, before the petrol is used.

The petrol does not cause any special smarting, and patients did not complain of it when questioned. If petrol is left wet on the skin and jaconet or adhesive plaster strips close together are applied over the dressing, preventing evaporation, blistering of the skin will occur, but otherwise this does not occur.

Petrol used in the manner described certainly seems to clean up the surface, and particularly the depths of wounds better than any other method we have tried. Many of the wounds, by shrapnel and fragments of shell or bombs, have small openings on the surface, but extend deeply for several inches, the tract being filled with a blackish mass of dirt, blood, and necrotic tissue. After cleansing such a wound by petrol as described above, this is all dissolved out, and a clean open track is left extending to the depth of the wound, which hardly requires drainage.

As to the results of this method of treatment it is more difficult to speak. Wounded cases dressed in a field ambulance are practically all evacuated within twenty-four hours, only very slight cases being kept for treatment, and it is practically impossible to follow up cases and compare the results of the petrol treatment with other methods. Those cases which we have dressed again on the following day seemed to do very well. As a rule the track of the wound seemed quite clear from suppuration; there was scarcely any inflammatory areola, and any discharge present did not appear to be infective pus.

The conclusion come to was that petrol was a most efficient means of cleansing wounds, especially the depths of punctured wounds, and that the removal of so much dirt and tissue débris must be beneficial. Very little petrol is used in the process, and it can be carried about conveniently.

It might be well, therefore, if this method were given a more extensive trial for the first cleansing of wounds as soon after being received as the condition of shock and haemorrhage will permit, and if such cases were followed up and the results noted and compared with those from other methods.

M. H. EMBREE, Lieutenant R.A.M.C.

A SUM of £20,000 is to be spent during the next three years by the American National Association for the Study and Prevention of Tuberculosis in an effort to control the spread of the disease. More than fifty towns and villages, with populations ranging from four to ten thousand, have been suggested as possible places for the experiment. Dr. Edward R. Baldwin of Saranac Lake, President of the Association, is chairman of a committee appointed to select a place.

Reviews.

THE DRINK PROBLEM OF TO-DAY.

FOREMOST among the sociological questions which the war has forced more than ever on public attention is the drink problem; and the publication of a revised and enlarged edition of *The Drink Problem of To-day*[1] edited by T. N. KELYNACK, M.D., is specially opportune. The earlier work published in 1907, with the shorter title *The Drink Problem*, has long been out of print, and the present volume attempts more fully to meet the special needs of the times, and claims to be in great measure a pioneer work. "Its main aim," the editor says, "is to present principles and indicate laws governing the drink problem." The intention has been either to exclude more controversial topics and purely polemical points altogether, or to keep them strictly in the background, "to deal with the drink problem of to-day in a strictly scientific spirit and to present all medico-sociological aspects of the subject in a comprehensive series of authoritative studies." The volume contains fourteen separate articles, each dealing with separate parts of the subject and each written by an expert in his subject. Each contributor has been allowed a free hand and is alone responsible for the chapter contributed. There is in consequence a certain amount of overlapping, but it nowhere leads to useless repetition, and is in fact an advantage as showing how slightly divergent views may yet tend to a similar result.

The opening chapter on the biology of alcoholism, by Dr. Harry Campbell, deals briefly with the history of alcohol and the evolution of alcoholic drinks. The writer suggests that systematic drunkenness was a product of early civilization, and he discusses among other topics the the natural liking for intoxicants, the influence of natural selection on the liking for alcohol, customs tending to promote drunkenness, and the relation of alcohol to ill health. This chapter is followed by one on the pathology of alcoholism by Professor G. Sims Woodhead. He lays it down that the less highly developed the protoplasm, the less is its activity affected by alcohol; he describes the effects of alcohol in bringing about cardio-vascular changes and definite changes in nerve cells and nerve fibres, and produces recent evidence that alcoholized patients and animals are more readily attacked by various febrile diseases such as pneumonia, erysipelas, typhoid, and other fevers, and that tubercle and syphilis are distinctly promoted by alcohol, through its interference with the mechanism of immunity. Next follows a chapter on the psychology of alcoholism by Dr. Claye Shaw, who deals with the nature of the alcoholic craving and the mental and moral characteristics of the alcoholic. Sir W. J. Collins next treats on the medico-legal relations of alcoholism, summarizing the limitations and defects in the present law. Alcohol and life assurance is dealt with by Mr. W. McAdam Eccles and Mr. Wm. Bingham, statistics being given as to the effects of alcohol on the expectation of life. Next follow chapters on alcoholism in relation to women and children, by Mrs. M. Scharlieb, M.D.; on alcohol and crime, by Dr. W. Sullivan; on alcoholism and poverty, by the Rev. J. C. Pringle; on alcoholism and national efficiency, by Dr. Robert Armstrong-Jones, and on alcohol and work by Sir Thomas Oliver. Sir Alfred Pearce Gould contributes an article on alcohol and war, in which he expresses the opinion that the use of alcohol in time of war is bad for the soldiers, as it lessens their power of physical endurance and resistance to extremes of heat and cold and to all infections, whether primary or secondary to wounds. Alcoholism and legislation is suitably dealt with by the Right Honourable Sir T. P. Whittaker, M.P., who advocates taking the liquor trade out of the hands of those whose interest is at present to sell as much as possible, and putting it under the control of persons who have no interest in pushing the sale, but whose only object would be to promote the public welfare. Mr. J. Turner Rae writes next on the educational development of national sobriety, and a final chapter on the arrest of alcoholism is contributed by the editor, Dr. Kelynack, who, after touching on some of the subjects treated by other contributors, gives an interesting summary of the important part which alcohol and alcoholism are exercising in relation to the great war. Referring to the German drinking habits, he says "alcohol has played no unimportant part in defeating the plans of our enemies," while, on the other hand, he points to Russia prohibiting the sale of vodka, and France forbidding the sale of absinthe. A good account is given of the restrictions placed on the sale of intoxicants in Great Britain since the war began, and of the effective work of the Central Control Board, and, in conclusion, a fairly full summary is given of statistics of the trade. The book was published before the experiment of taking over the beershops in Carlisle by the Central Control Board was commenced, and it might well be claimed that that experiment was largely in accord with numerous suggestions of this book. The success of the restrictions described by Dr. Kelynack is well seen in the most recent statistics, which show the enormous reduction in the amount of drunkenness and crimes from drunkenness throughout the country. The book may well claim to have raised the subject to a distinctly higher level of discussion. It deals with the problem of drink from a scientific standpoint, and its study cannot fail to be of the greatest advantage to medical practitioners, sociologists, and legislators.

[1] *The Drink Problem of To-day, in its Medico-Sociological Aspects.* Edited by T. N. Kelynack, M.D. London: Methuen and Co. (Cr. 8vo, pp. 318. 7s. 6d. net.)

THE OPEN-AIR TREATMENT IN AMERICA.

EDWARD LIVINGSTON TRUDEAU, the pioneer of the open-air treatment of tuberculosis in America, who died on November 15th, 1915, left an autobiography, which has recently been published.[2] The book has a twofold interest as the record of a struggle with a disease which after many alternations of defensive and offensive, proved victorious at last, and as the history of the growth of the Saranac Lake Sanatorium from the smallest beginnings to an institution of world-wide celebrity. It is delightful as a revelation of a nature in which gentleness and modesty were combined with a fine fortitude and an energy in work for the good of mankind which in the circumstances was heroic. It cannot be denied, however, that the flow of the story is marred by unnecessary details, repetitions, and otiose reflections; this makes the book somewhat tedious, and although we cannot help admiring and loving the author, we could wish that he had a little more literary art.

Trudeau was of French descent. His father, a doctor, was a great friend of the famous naturalist, John J. Audubon, whom he accompanied on many scientific expeditions and helped with the anatomy of the great work on ornithology, for which he drew illustrations of birds and eggs. The same love of nature was in the blood of the son, and when stricken with tuberculosis in 1872 he threw up his practice in New York and buried himself in the Adirondacks, then "an unbroken wilderness and considered a most dangerous climate for a chest invalid," but giving large opportunities for hunting and the pleasures of an open-air life in the great forest. So strongly did he feel that his span of life was to be short that he lost all interest in a profession he thought he would never live to practise. He began, however, by degrees to practise among summer visitors, and in 1882, after reading an account of a visit to Brehmer's sanatorium in Silesia, he resolved to try the new method of treating tuberculosis, of which nothing was then known in America. Trudeau had the happy gift of making friends, and with their help he built a few small cottages in which patients could be housed cheaply and comfortably. The Adirondack Cottage Sanatorium, which was established in 1884, has now grown into a picturesque little village consisting of thirty-six buildings, with macadamized roads, grass lawns and flower beds, which have taken the place of boulders and rough pasture. Besides the cottages, there are an infirmary for bedridden patients, a nurses' home, a post office, a library, a reception and medical building, with a laboratory and *x*-ray department, a pavilion for entertainments, a workshop where patients are taught fancy leather work, book-binding, brass work, and frame making and photography, and a chapel.

Trudeau had at first many troubles about water supply, drainage, coals, and so forth; he had to do all the medical

[2] *An Autobiography.* By Edward Livingston Trudeau, M.D. Philadelphia and New York: Lea and Febiger. 1916. (Med. 8vo, pp. 322; illustrated. 2 dols.)

work himself, he had no nurse, and no one to attend to the patients in their cottages. But in spite of all difficulties the fame of the place spread, and sufferers flocked to Saranac Lake. Among them was Robert Louis Stevenson, who spent the autumn and winter of 1887–1888 there. At Saranac his essays *Pulvis et Umbra*, *The Lantern Bearers*, a *Christmas Sermon*, and some parts of the *Master of Ballantrae* were written. "R.L.S." was bored by enthusiastic admirers; on one occasion after bowing out an importunate lady and banging the door after her, he said, "Trudeau, it is not the great unwashed whom I dread, it is the great washed." Though the doctor admired his illustrious patient their relations would have been classed by Charles Lamb as an example of imperfect sympathies. Stevenson lived in an ideal world and tried to shut out the unpleasant facts of life. He was enticed one day into the laboratory but quickly escaped, saying, "Trudeau, your light may be very bright to you, but to me it smells of oil like the Devil."

Among those who took an interest in Trudeau's work were Osler and W. H. Welch, and he says it was largely through Osler's influence that he was elected the first president of the National Association for the Study and Prevention of Tuberculosis. The laboratory has had a powerful educational influence. The amount of research done by his associates was revealed to him on his 60th birthday, when they presented him with two handsome volumes containing seventy papers representing their own work published in various medical journals in America and other countries from 1887 to 1908. Trudeau asks if the laboratory will some day extend its usefulness by becoming a teaching institution for advanced students and specialists. This question has already been answered. A foundation bearing his name was formally opened on May 17th, 1916. Its objects are to conduct research work, to investigate the causes of tuberculosis, and develop methods of treatment. There are three departments—the Trudeau School of Tuberculosis, the Saranac Laboratory for the Study of Tuberculosis, and a Society for the Control of Tuberculosis. Among the lecturers in the school are Professor W. H. Welch, Dr. Theobald Smith, Director of the Rockefeller Institute, Princeton, and Dr. Herman M. Biggs, State Commissioner of Health of New York. The institutions available for the purposes of the school comprise the Adirondack Cottage Sanatorium at Saranac, the New York State Hospital at Ray Brook, the Stony Wold Sanatorium at Lake Kushaqua, and the Sanatorium Gabriels, all in the Adirondack region and affiliated for the creation of a research and teaching institution of the first class. The humble root planted thirty-two years ago already shows promise of growing into a noble tree.

NOTES ON BOOKS.

THE address delivered by Dr. Thomas J. Watkins, President of the American Gynaecological Society, at its annual meeting in 1915, discussing the work it has done for gynaecology, is published in the fortieth volume of the society's *Transactions*.[1] The president dwelt on Noeggerath's contribution on latent gonorrhoea, especially with regard to its influence on sterility in women, which appeared in 1876; it was much assailed, but further experience has shown that Noeggerath's views were correct. The new volume contains a valuable store of monographs and articles, many of which are already known to our readers. The most important perhaps are those prepared by Dr. Franklin H. Martin on ovarian transplantation, by Hiram Vineberg on the fate of the ovaries left *in situ* after hysterectomy, and by Dr. Chalfant on subcutaneous transplantation of ovarian tissue. General surgeons will study with interest Dr. Bissell's notes on the surgical treatment of the tuberculous ureter in the female and Dr. Vineberg's paper on Kelly's method of cystoscopy.

A good general introduction to the study of colloids, suitable for medical men or students who wish to know more about a very progressive branch of science, is supplied by E. HATSCHEK'S little textbook, now in its second edition.[2] Colloid chemistry is being more and more frequently called upon to explain the subtle problems of the physics and chemistry of the cell, when the physiologist or pathologist (as the case may be) finds himself gravelled for an explanation. The reader who has digested the readily-assimilable contents of Mr. Hatschek's little volume will find himself able to grasp such explanations and to realize their value.

Miss MACMILLAN'S *Infant Health*[3] contains the substance of a course of lectures delivered by the authoress to voluntary health visitors in Aberdeen and Oxford. In a foreword by Professor Osler he says that it should be most helpful to district visitors and nurses, and could be put in the hands of intelligent mothers. "It is not easy," he adds, "to give just the needed amount of information on health subjects, but Miss MacMillan has found the happy mean between a technical treatise and a popular handbook." We gladly endorse this commendation.

[1] *Transactions of the American Gynaecological Society*, vol. xl. for the year 1915. Philadelphia: W. J. Dornan. 1915. (Med. 8vo, pp. 600.)

[2] *An Introduction to the Physics and Chemistry of Colloids*. By E. Hatschek. Second edition. London: J. and A. Churchill. 1916. (Cr. 8vo, pp. 114; 17 figures. 3s. net.)

[3] *Infant Health: A Manual for District Visitors, Nurses, and Mothers*. By J. (Shawnet) Cameron MacMillan, C.M.B., A.R.San I. London: H Frowde; Hodder and Stoughton. 1915. (Fcap. 8vo, pp. 136; 9 figures. 2s. net.)

MEDICINAL AND DIETETIC PREPARATIONS.

Paraffin Treatment of Burns.

WE have received from a correspondent a specimen of "ambrine," the petroleum wax preparation used in the treatment of burns, as noted at p. 333. It is of a greyish-black colour which is not quite uniform. It has been examined for us by Messrs. Squire and Sons, who report that the substance accountable for the colouration is in suspension and not in solution, as the coloured matter settles out when the wax is melted and is altogether removed by filtration; the quantity of the colouring matter is relatively small. The solution of the wax in a neutral solvent is neutral to litmus paper. The following results were obtained upon analysis:

Melting point	50° C. (122° F.)
Specific gravity at 15.5° C. (60° F.)	0.908
Acid value	1.12
Ester value	4.5
Sapon. value	5.62
Ash	Nil.

These figures indicate that the wax contains only a very small proportion of resinous ingredients. Dr. Sandfort, we understand, states that the wax, to which he has given the name "ambrine," consists of paraffin to which succinite, by which probably is intended oleum succini, is added. When blown on to the skin it instantly solidifies into a tough tissue-paper-like film. Some difficulty may be encountered in obtaining in this country a spray with the proper bore, but this can, no doubt, be overcome by experiment. Professor Peters figured a rather elaborate nozzle in the JOURNAL of 1898, vol. ii, p. 621, but the cold water he employed for making casts is not required for the present purpose. The paraffin he used melted at 125° F.

MEDICAL AND SURGICAL APPLIANCES.

A Wristlet Ligature Holder.

MR. PERCIVAL P. COLE (London, W.) writes: The wristlet ligature holder, as illustrated, has been made to my design by Messrs. Mayer and Meltzer.

I find it very convenient as a time-saving device, where a number of bleeding points have to be tied—in the course, for example, of such operations as removal of the breast, glands in the neck, and thyroidectomy. The lid is removable, and, when secured by a bayonet catch, leaves a small slit-like aperture, through which the ligature material emerges. Owing to its small bulk, it can be worn throughout an operation without inconvenience. The skeleton reels are removable, and a number can be kept ready wound and sterilized. A reel will easily hold 40 ft. of fine thread. If gut be used, iodine should not be utilized in its preparation, owing to its action on the metal.

A FRENCH veteran of 1870, who volunteered last year at the age of 76 and has been serving as a sergeant in the engineers in every position of danger, in spite of offers to give him employment in the rear, has been awarded the Croix de Guerre.

EXPERIMENTS ON LIVING ANIMALS.

A REPORT showing the number of experiments on living animals during 1915 under licences granted under the Act 39 and 40 Vict., c. 77, has just been issued.

ENGLAND AND SCOTLAND.

The return for England and Scotland is signed by the chief inspector, Professor G. D. Thane. Twenty-one new places were registered and two removed from the register during the year. Of the new places registered thirteen are laboratories connected with naval or military hospitals and sanitary institutions. The total number of licences during 1915 was 664. Reports were furnished by—or in a few cases on behalf of—nearly all the licensees, but in three instances it was not possible to obtain the necessary report owing to the absence of the licensees on war service. The return shows that 323 licensees performed no experiments. A table (II) gives the names of the licensees and the number of experiments performed by each. It is divided into two parts, which contain respectively experiments done without, and with, anaesthetics.

Number of Experiments.

The total number of experiments in Table II (A) is 2,771. Of these there were performed:

Under Licence alone	1,505
Under Certificate C	275
Under Certificate B	782
Under Certificate B+EE	209

Table II (B) is devoted entirely to inoculations, hypodermic injections, and some few other procedures performed without anaesthetics. It includes 67,802 experiments, whereof there were performed:

Under Certificate A	67,521
Under Certificate A+E	270
Under Certificate A+F	11

The total number of experiments was 70,573, being 16,680 fewer than in 1914; the number of experiments included in Table II (A) shows a decrease of 2,118; that in Table II (B) a decrease of 14,562. During the year 11,657 experiments were performed by fourteen licensees in the course of cancer investigations. Of these 281 are in Table II (A) and 11,376 in Table II (B); the latter are almost entirely inoculations into mice. Seventy licensees reported over 20,000 experiments for Government departments, county councils, municipalities, and other public health authorities. Twelve licensees reported nearly 25,000 experiments for the testing of antitoxic serums and vaccines and for the testing and standardizing of drugs.

Inspections.

During the year the several registered places were frequently visited, and a large number of experiments were witnessed by the inspectors. For the most part the visits were made without previous notice. The animals were found suitably lodged and well cared for, and the licensees generally attentive to the requirements of the Act and the conditions attached to their licences by the Secretary of State.

Irregularities.

The irregularities which came under notice were few and not serious.

Two licensees performed, in connexion with hospital work, three inoculation experiments on rodents, after the certificates which they held for such experiments had expired. They expressed their regret, and submitted fresh certificates. The Secretary of State caused a suitable admonition to be addressed to them, and their new certificates were allowed to come into operation.

A licensee who held Certificate A for inoculations performed some experiments in which he exposed animals to certain gases which were found to be destructive to vermin. As it appeared that this was due to a misreading of his certificate, he was cautioned as to the importance of a careful adherence to the exact terms of the Act and of the licence and certificates granted thereunder.

A licensee performed two inoculation experiments at a military hospital which was not a registered place. It appears that this arose from a misconception, it being thought that the visit of the inspector was sufficient to ensure registration, so that no official application was made. When this became known, the licensee had left on war duty. The place was then registered and a new licensee was authorized to perform experiments there.

A licensee holding Certificates B+EE for experiments on dogs and cats performed eleven experiments in excess of the number allowed by these certificates. He explained his error as being due to his absence owing to illness during the year 1914, and his impression that he had a larger number of experiments left than was the case. He was admonished, and cautioned as to his future proceedings.

A licensee who held Certificates B+EE for experiments on dogs and other animals made two injections into dogs which were not covered by the terms of those certificates. He explained that he had presumed that the experiments were covered by the certificates. He was told that no experiments can be performed under certificates except such as fall within their definition strictly construed. He expressed his deep regret at having exceeded his powers, and as the Secretary of State was satisfied that it was not a wilful contravention the licensee was censured, and the licence was allowed to remain in operation.

IRELAND.

The inspector, Dr. Joseph O'Carroll, states that during the year an outhouse and laboratory at the Military Barracks, Tipperary, were added to the list of registered places. The number of persons holding licences at the end of 1915 was 27. Four new licences were issued, three lapsed, one licensee died, and one licence was revoked at the request of the licensee. The renewal of two licences was deferred. During the year 590 experiments were performed by 17 licensees, 66 being under licence alone and 524 under certificate; 488 were simple inoculations under Certificate A. In 91 cases the object of the research was physiological, in 442 it was pathological, and 57 had a therapeutic aim. Three communications to learned societies—two physiological and one pathological—are recorded as based on the experiments of 1915. The inspector concludes by stating that he has every reason to believe that the holders of licences obeyed the spirit as well as the letter of the Act, and that experiments were not unnecessarily multiplied.

Medical News.

DR. W. W. KEEN of Philadelphia has been invited to give the second Colver Lectures at the Brown University, Providence, Rhode Island. The university was founded 150 years ago, but the Colver Lecture is a new endowment. The first course was given by the president of Johns Hopkins University last winter, and Dr. Keen's course will be given next January.

THE Germans having now experienced the effect on their own soldiers of gas attacks have been devising gas masks and would appear to have resorted to a rather crude method of testing their efficiency. A correspondent of the *New York Times* with the German army on the Somme states that he was taken to the testing-room at the central gas department through which every German soldier with a new gas mask must pass before being sent to the trenches. They are kept in this chamber half an hour, and if the officer who watches them through the window observes that they make frantic gestures this is considered to be *prima facie* evidence that the masks leak. It is claimed that the masks remain efficient for eight hours, but the whole story is not very clear, for the writer also states that enough masks are kept in store at one point for two army corps and rushed to the front whenever a big gas attack is reported.

THE Department of Health of the State of New Jersey some time ago began the publication of *Public Health News*, a periodical which is sent free to any person who applies to the director. The last issue, that for July, is an infantile paralysis number. It states that in New Jersey 47 cases were reported in 1911, 59 cases with 21 deaths in 1912, 87 cases with 20 deaths in 1913, 35 cases with 18 deaths in 1914, and 35 cases in 1915. For the first six months of 1916, 20 cases were reported. The department has issued a circular to local boards of health in which it is pointed out that acute poliomyelitis is an infectious and communicable disease, and that healthy persons who show no symptoms may harbour and transmit the infective organism to others. The virus, it is added, has been shown to exist in the nose, the mouth, the pharynx, and upper air passages and the intestine of infected persons, and in the dust of a room that has been occupied by an acute case. Evidence of the transmission of the disease by the bite of the *Stomoxys calcitrans* (stable fly) has not been definitely verified, but it is considered quite probable that flies of various species do play a part in the spread of the disease by carrying infective material. The duration of the period of infectivity or contagiousness has not been definitely determined, but experiments on animals have shown that the virus sometimes persists in the nasal mucous membrane for many weeks. It is stated that the mortality has been as high as 25 per cent. in some outbreaks, but that in others it has been from 13 to 16 per cent. The rate of permanent paralysis in those who recover is said to be 50 per cent. The average incubation period is stated to be about seven days, but it may vary from three to fourteen days.

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SATURDAY, SEPTEMBER 2ND, 1916.

THE EDUCATIONAL INQUIRY COMMITTEES.

THE Prime Minister has admitted on many occasions in response to parliamentary representations made to him, that the existing system of education in this country, with reference especially to science and modern languages, ought to be overhauled. His earlier statements seemed to convey the impression that the matter was to be the subject of inquiry by the Cabinet itself, but this was far from satisfying those members of Parliament most interested in the subject. They believed, no doubt, that the Cabinet was too busy to conduct any adequate inquiry into so complex a subject. This view has prevailed and two committees have been appointed. The first, or Science Committee, is "to inquire into the position occupied by natural science in the educational system of Great Britain, especially in secondary schools and universities; and to advise what measures are needed to promote its study, regard being had to the requirements of a liberal education, to the advancement of pure science, and to the interests of the trades, industries, and professions which particularly depend upon applied science."

It was at first announced that Lord Crewe was to act as chairman, but unforeseen circumstances have prevented him from accepting the office, and it is, perhaps, not altogether a misfortune that this should be the case, for he has been replaced as chairman by the President of the Royal Society, Sir J. J. Thomson, Cavendish Professor of Experimental Physics at Cambridge. With him as representatives of science are Dr. H. B. Baker, F.R.S., Professor of Chemistry in the Imperial College of Science, and Dr. E. H. Starling, Jodrell Professor of Physiology at University College. The educational expert members of the committee are Dr. Michael Sadler, C.B., Vice-Chancellor of the University of Leeds; Mr. W. W. Vaughan, Master of Wellington College; Mr. Graham Balfour, Director of Education for Shropshire; Mr. C. W. Crook, President of the National Union of Teachers; Miss E. R. Gwatkin, Mr. William Neagle, and Mr. F. G. Ogilvie, C.B., Secretary of the Board of Education for the Science Museum and director of that museum. The representatives of trade are Sir William Beardmore, chairman of the engineering firm which bears his name, and Sir G. H. Claughton, Chairman of the London and North-Western Railway. The committee is completed by the addition of two members of Parliament—Mr. F. D. Acland, Parliamentary Secretary of the Board of Agriculture, and Sir Henry Hibbert, Chairman of the Education Committee of the County Councils Association. The secretary is Mr. F. B. Stead, an inspector of schools.

The reference is very wide, and the fruitfulness of the inquiry must depend to a very large extent upon the direction given to it. The phrase instructing the committee to advise what measures are needed to promote the study of science, having regard to the interests of the trades, industries, and professions which particularly depend on applied science, is oddly worded. The inquiry should have regard not to the interests of the trades, industries, and professions as though they were things or personalities apart from the nation, but to them as parts of the nation, through and by which it maintains itself, increases its efficiency, and adds to the happiness of its individual members. The phrase may be used by obscurantists to hamper the committee as the idea which seems to find expression in it has hampered industry and some professions in the past. Science works for the good of humanity, not to gratify ambitions of its own, and, so far as it is national, for the good of the nation as a whole. If the bureaucratic idea that science is something which is to be kept quiet and obedient by doles is allowed to dominate the committee, it will fail to do any good. The master idea by which the labours of the committee should be informed is to show how the study and application of science can be made an essential part of the national life; to do the draftsman of the instruction justice it must be admitted that he had some inkling of the truth when he told the committee to have regard to the requirements of a liberal education. Hitherto a liberal education has meant a knowledge of humane letters, and chiefly of such knowledge as may be gained through the medium of dead languages. At the present day there are a good many men, especially among the governing classes, considering themselves well educated, who profess without regret total ignorance of science; they look upon it either as a harmless hobby or as a form of knowledge which the State or industry can purchase at a low price from the misguided people who have given themselves up to "stinks." We very much hope that Sir J. J. Thomson and his committee may succeed in making this sort of person a little ashamed of himself.

The phrase in the instruction referring to pure science seems to be open to misunderstanding, for it will be apt to convey to the uninformed persons to whom we have been referring the idea that "pure" is a particular department of science. Nothing was more purely pure than Clerk Maxwell's work, yet physicists have not yet finished applying it. A great deal of Lord Kelvin's work was pure science, yet throughout his long life he was himself never ceasing to apply it. In the case of medicine, too, no hard-and-fast line can be drawn. Physiology, for instance, may be studied, and studied profitably, as a pure science, but facts established by physiological inquiry are quickly utilized by the applied science of the practice of medicine. The first object of the committee must be to instruct the governing classes and those who determine the policy of the older English universities. It is devoutly to be hoped that it will not lose itself in a wilderness of evidence. The facts the committee requires in order to advise on main principles are already in the possession of its members, and the Prime Minister has frequently promised that the inquiry the Government recognizes to be necessary should deal with main principles and be speedily conducted. If the Science Committee is to consider such matters as the provision of scholarships, bursaries, etc., it is to be hoped that they will be relegated to a secondary place and made the subject of a separate report.

The other committee—that on modern languages—is instructed "to inquire into the position occupied by the study of modern languages in the educational system of Great Britain, especially in secondary schools and universities, and to advise what measures are required to promote their study, regard being had

to the requirements of a liberal education, including an appreciation of the history, literature, and civilization of other countries, and to the interests of commerce and public service." Its chairman is the first Civil Service commissioner. That commission was set up in 1855 to apply tests of fitness for junior situations in the Civil Service; fifteen years later it was instructed to use competitive examination as the universal system of testing fitness. As has recently been pointed out with authority, the system actually involved has had a numbing influence on the development of higher education in this country.

EXPLOITING PANEL DOCTORS.

A SHORT editorial note appended to a letter from Dr. de Gébert in the SUPPLEMENT of August 19th, page 66, has had a somewhat mixed reception. On the one hand, it was evidently welcomed by a number of panel doctors as suggesting a means of relieving a position which has become unbearable, but the *National Insurance Gazette* in a leading article last week expressed the opinion that the advice given was "unfortunate," and that "if members of the British Medical Association take that advice there will be trouble." The note must be read in conjunction with Dr. de Gébert's letter; he complained that an insured person went to him having a medical card which had not been signed by any other doctor; he signed it, presumably sent it to the Clerk of the Insurance Committee, and attended the patient for a fortnight or three weeks, and then found out that the patient had not been put on his list. The reason for this is not stated, but it must have been either that the patient was for some reason not entitled to medical benefit, or that the clerk of the committee for some cause had delayed in dealing with the matter. In the latter case the doctor had just ground for complaint, especially as the clerk has recently stated that "when a doctor signs a medical card accepting the insured person on his list he immediately assumes responsibility for the treatment of such insured person." The editorial note assumed that the person was not placed on the doctor's list because it was found that he was not entitled to medical benefit. In the note it was said that "it is monstrous to expect a doctor to accept responsibility for panel treatment of a person who may prove to be disentitled to medical benefit," and it was added, "whenever there is any doubt, the doctor applied to should refuse to sign the card and refuse to give treatment unless the person pays for it." The question of the responsibility of panel doctors for the treatment of unassigned persons is quite a separate question and hardly affects the case. The penalty for refusing to treat an unassigned person entitled to medical benefit would be loss of a share in the unassigned funds which at present appear to be rather a shadowy quantity; but surely there could be no penalty for refusing to treat an unassigned person who was found to be disentitled to medical benefit, and to give prescriptions in doubtful cases would be simply gambling with the drug fund.

It may be said that the possession of a medical card entitles the possessor to free treatment from a panel doctor, but this brings us to the point of our protest. It ought to be true, but is not true, that a medical card shows a title to medical benefit. It is certain that at present there are thousands, probably many hundreds of thousands, of persons in possession of medical cards who have become disentitled to medical benefit. In other words, it by no means follows that a panel doctor will receive any remuneration whatever when he signs a card and gives treatment, or that the chemists will be paid for the drugs they supply. An enormous proportion of insured persons who have joined the army have neglected to give up their cards or notify their society, and it is quite a common occurrence for soldiers on furlough to present their cards to their former panel doctor and expect free treatment; their names may still be on the doctor's list. In the same way numbers of persons who have never been assigned to any doctor and who have joined the army have kept their cards and imagine that they have only to present them to a panel doctor to obtain free treatment. In all these cases the doctor should understand that the Insurance Committee will never be able to pay any capitation fee for these persons from the time they joined the army; the army authorities are responsible under certain strictly defined conditions.* It is, of course, often the insured persons themselves who are primarily at fault; they ought to have notified their societies when they joined the army, but it is matter for surprise and complaint that the army authorities have not done more to see that the men carry out their duty in this respect.

If this were all, however, the profession would hardly have been inclined to utter any protest at this time, for it has shown itself ready to put up with a good deal of unfair treatment rather than trouble either the army authorities or the men who are ready to fight so nobly for their country. But altogether apart from the war the index registers and the medical registers have become a disgrace to the National Insurance system, and the doctors, who are the least of all responsible for either of the registers, are made the chief sufferers. Both registers are inflated to an extent which is unknown, but unquestionably very great, and the payments to Insurance Committees and panel doctors for medical benefit have to be settled by a system of juggling with figures in which the committee with the worst kept register comes out best. As was pointed out on a previous occasion, it is a mere matter of luck whether any particular panel doctor gets anything like his due, and it is a poor consolation to individuals to be told that the sum total paid to the profession is as nearly accurate as possible. Some recent investigations have shown that quite an astounding number of persons have been receiving medical treatment from panel doctors when they were not entitled to it—persons, for example, disentitled owing to penalty arrears and women who have married and have later lost the right to medical benefit.

The whole system of dealing with these cases seems designed to put the doctors at the mercy of the carelessness of innumerable persons. It is the duty of the approved society at once to notify the Insurance Committee when a person becomes disentitled, and then it is the duty of the Committee to write to the person asking for the return of his medical card. But the society officials often neglect to notify the Committee until several months have passed, and during all this time the doctor may be actually giving treatment and seeing at intervals the medical card, which appears to be in order. When the Committee, after this interval, actually receives the society's note, another delay often occurs, but at length a letter is sent by the Committee to the insured person. That person again may delay in returning the card, and it is disquieting to find from

* The claim must be made on Army Form O. 1667, the instructions in which must be precisely followed. According to a statement put out by the Insurance Commission for England last year (SUPPLEMENT, March 13th, 1915), clerks of Insurance Committees have been provided with copies of this form; copies can also be obtained from the Medical Secretary of the British Medical Association.

reports of several committees that a proportion as large as 30 per cent. of the letters are returned, after a delay of a week or two, through the dead-letter office, marked "Wrong address; not found." An insured person who has removed may not know that he has become disentitled to medical benefit, may still retain his card, and the doctor may still be giving treatment. It is surely astonishing that the Commissioners should have done practically nothing except write letters to societies and committees reminding them of their duties, letters of which apparently these bodies take no notice.

It has become only too clear that until the societies and, if necessary, the committees are fined for their neglect, and the fine paid to the doctor to compensate him for services which he should never have been called on to render, the abuse will continue indefinitely. Most of the cards have been unchecked for over two years, and if the expense of issuing fresh cards is too great, the least that could be done would be to require them to be officially stamped at suitable intervals to show that they continue to be valid vouchers. We repeat that though the medical card may appear to be in order, it is no guarantee that the doctor depending on it will ever be paid for his services. We have sufficient knowledge of the profession to be assured that emergency cases needing urgent and immediate treatment, whether entitled or disentitled to it, will receive what is immediately necessary, even though the doctor knows at the time that he will never be paid; but to expect after the immediate necessity has passed further treatment when there is any doubt, and until the doctor is notified that the person has been placed on his list, is unreasonable and inequitable. As matters are at present, we do not see what other course is open to the doctors than that suggested in the editorial note. A desperate disease requires a desperate remedy. The profession is losing large sums through the present muddle. Protests, which have been so often made, have had no effect, and it is only by united action such as has been suggested that the injustice will be righted.

PARAFFIN TREATMENT OF BURNS.

WITH reference to the paraffin treatment of burns, a note on which was published in these columns on July 29th, p. 153, we have received some fresh information from a correspondent who has had opportunities of observing its use at the Hôpital St. Nicolas, Issy-les-Moulineux, Paris. His remarks on the subject may be summarized as follows: The hospital mentioned is the only one at which the paraffin treatment has hitherto been applied on a large scale, and it is there known as "ambrine treatment." The hospital itself is an ordinary French auxiliary military hospital of about 500 beds, of which 80 have been set aside for the treatment of burns by ambrine. These beds are under the control of Dr. Barthe de Sandfort, the deviser of "ambrine," but the treatment itself is applied by ordinary military surgeons. The wax employed, a semitransparent substance of violaceous hue, is prepared under Dr. de Sandfort's own supervision, and its exact composition has not yet been disclosed. This, however, is of very small practical importance, since everything points to the conclusion that any paraffin wax of the same melting point and degree of ductility would have precisely the same effect (see p. 329). Strictly speaking, it is not a treatment, but a form of dressing, which is applied in the following fashion: The wax having been reduced to the consistency of water by heating it to about 80° Centigrade over a spirit lamp, is sprayed on to the burn until its surface is dulled, or, in other words, until its colour is obscured by the interposition of a fine delicate screen of wax. This first layer applied, the second is put on by means of a paint brush, the two layers together being about the thickness of ordinary blotting paper. The formation of the first pellicule is instantaneous, and that of the second is hardly less rapid. The completed pellicle is then covered by a very thin layer of cotton-wool, kept in place either by a bandage or a few dabs of wax. When the time comes to change the dressing one corner is raised and the whole dressing, wax pellicle and cotton-wool included, is gently rolled off. It comes away without any difficulty, since exudation from the wound has already ended the contact between pellicle and wound surface. It is, in fact, mainly the amount of this exudation that regulates the frequency with which the dressing must be renewed. If the output of pus is considerable it begins to trickle out from under the edges of the dressing within twenty-four hours, and the latter, being now quite loose, must be replaced. If the quantity of exudation is small the interval between the dressings may be correspondingly longer. Whatever the interval, the surface of the wound is thoroughly cleansed before the fresh dressing is applied. In performing this cleansing the greatest care is taken to avoid injuring any granulations that may be forming. To this end the cleansing is effected by making a fluid flow over the wound surface. Usually plain boiled water is used for this purpose, but hydrogen peroxide may be added in early cases still presenting fragments of scarred tissue or unseparated sloughs. However exuberant the granulations may appear, nothing is done to repress them, for it is held that any interference with the granulations may lead to the formation of scar tissue. The first sign of the approaching transformation of the granulations into dermal tissue is commonly the appearance of a circular depression, an islet of epithelium becoming visible at its base a day or two later. Such depressions and islets may appear several inches away from the unharmed skin surrounding the burn. The primary and quite incontestable advantages of the treatment are two: it is agreeable to the patient because entirely painless; it is convenient to the surgeon because easily and quickly applied. As for its results, prolonged study would be necessary to determine how they compare with the "open" treatment which was recently in use in the navy, but they appear certainly more satisfactory than those of treatments hitherto commonly used. All these cause a good deal of pain, are slow in effecting a cure, and often leave big cicatrices. This difference in result seems due to the fact that in paraffin treatment properly applied there is no injury of granulation tissue or other interference with Nature's own efforts to bring about a cure. It is an essential part of paraffin treatment that the first pellicle should be secured by spraying on the wax from a heated container, for in this way any touching of unprotected granulations is avoided. It is possible that the treatment by paraffin spray would be found useful in dealing with ordinary ulcers, and in any case it is certain that the study of its application to raw surfaces is worth pursuing. It will be the easier to appreciate the results at the hospital at Issy because the progress of the cases there is habitually recorded by means of coloured photographs.

THE BELGACHIA MEDICAL COLLEGE, CALCUTTA.

THIS institution, which is described as "the first medical college in Bengal organized by private enterprise, and managed entirely by Bengali medical men," was formally opened by Lord Carmichael, Governor of Bengal, on July 5th, 1916. The history and development of the college were related by the president, Dr. Bannerjee. It has long been realized in India that the Government medical colleges and schools, whose main purpose is to provide officers for the public services, are not adequate to supply medical

practitioners to meet the requirements of the native population. Efforts have been made from time to time to start private medical schools under Indian control and support, and staffed by Indian teachers; but for lack of funds, suitable accommodation, and appliances these have not been successful, and have not obtained Government recognition. The present college commenced work in 1887 as the "Calcutta Medical School" under great difficulties. "There was no outdoor dispensary, dissection was not allowed, there was no hospital and no possibility of clinical instruction." Pupils were permitted in 1888 to attend the Mayo Native Hospital and its branches; in the same year an outdoor dispensary was opened; in 1889 permission was obtained for dissection; in 1897 a small hospital, containing fifteen beds, was provided; in 1902 a hospital, containing forty beds, was opened at Belgachia, a suburb of Calcutta, where the Bengal Veterinary Department and Veterinary Hospital and the Macleod Veterinary College are located. The cost of erecting the hospital was met from savings, private contributions, and the surplus of a fund raised "to give a suitable reception to His Highness Prince Albert Victor on the occasion of his visit to Calcutta in 1890." The new hospital was named after this Prince. In 1904 the "Calcutta Medical School" was amalgamated with the "College of Physicians and Surgeons of Bengal." Instruction had hitherto been given in the vernacular up to the standard of the Government vernacular schools. Teaching was now conducted in English, and extended to five years up to the standard of the Government College. Under the encouragement and liberal support of the Government of Bengal, the Calcutta Municipality, the University of Calcutta and influential and wealthy native gentlemen, the assistance of Surgeon-Generals Sir Pardy Lukis and W. R. Edwards, and the praiseworthy efforts of the teaching staff, the hospital has been enlarged, suitable college buildings have been added, a curriculum of study up to the University M.B. standard arranged, and the institution has been affiliated to the Calcutta University "for the preliminary scientific M.B. examination." Lord Carmichael's speech was sympathetic and laudatory. As indicating the need of additional means of medical education he mentioned that "last year 725 students applied for admission to the Medical College, but the number of vacancies was only 137; at the Campbell (vernacular) school there were 530 applicants for admission but only 122 vacancies." The organization of the Belgachia Medical College is highly creditable to all concerned, and constitutes an important step in providing practitioners of rational medicine for service among the peoples of Bengal.

PURIFICATION OF WATER BY BLEACHING POWDER.

MR. CREE BROWN, Professor of Engineering in the College of Science, Poona, has described in the *Indian Journal of Medical Research* an apparatus for the purification of water for troops by hypochlorite of lime. Such an apparatus, he points out, must be sufficiently simple for use by unskilled men, and the result must be thoroughly reliable. His apparatus consists of two tanks, one above the other. Into the upper and smaller tank water is pumped from the source of supply. The hypochlorite solution is mixed with it as it leaves this tank to run into the larger tank, in which the process is completed in the course of a few minutes. The water entering the lower tanks smells strongly of chlorine, but that drawn off from the bottom of it is tasteless, odourless, and free from dangerous bacteria. The apparatus by which the mixing is carried out consists of a glass gauge, protected by a brass tube and connected with both the upper tank and the gauge by a three-way cock, which is an essential part of the design. The hypochlorite is admitted through the glass gauge. The hypochlorite solution is mixed in a bottle by agitating bleaching powder and water in the correct proportions. Free lime is allowed to settle; the upper receiving tank is then filled with untreated water and the hypochlorite solution poured into the gauge to the same level as that of the water in the tank. The three-way cock is then opened so that the untreated water and hypochlorite solution flow through it into the tank below, mixing *en route*. As the water levels in the tank and in the glass gauge fall at the same rate the resulting mixture is in the correct proportions throughout. In a note appended to the paper Captain J. Morison, I.M.S., describes a modification of Professor Sims Woodhead's method of dosing the bleaching powder which he has had in use since July, 1915, as a daily routine at Poona. Into each of seven flasks 500 c.cm. of the water to be treated is introduced. To each is added a measured quantity of a freshly prepared 1 in 1,000 solution of hypochlorite of lime, and the samples are stirred with a glass rod, or rotated to ensure mixture. The convenient quantities are: 0.5 c.cm., 0.6 c.cm., 0.7 c.cm., 0.8 c.cm., 0.9 c.cm., 1 c.cm., and 1.1 c.cm. After a quarter of an hour each sample is tested with a crystal or a few drops of a solution of potassium iodide and a few drops of fresh starch solution. The sample with the smallest quantity of hypochlorite solution, which shows a distinct blue colour, has received sufficient bleaching powder solution to make it bacteriologically safe. As these samples were each of 500 c.cm., and the strength of the solution of bleaching powder 1 in 1,000, the weight of bleaching powder in pounds required to treat 1,000,000 gallons of water is obtained by multiplying the number of cubic centimetres of the test solution used by 20. As samples of bleaching powder, especially in the tropics, vary in the percentage of available chlorine they contain, it is necessary to repeat the estimation of the dose from time to time. Where the water is derived from a river, the estimation should be made daily. The apparatus was tried at the camp of the Poona Volunteers at Chinchwad with satisfactory results. The water was from a surface well in the midst of agricultural land. After treatment with 15 lb. per 1,000,000 gallons in the way described, the water used from the second tank contained no lactose fermenters in 100 c.cm., and was absolutely free from smell or taste. The daily average number in camp during the week of the trial was 200, and there was no case of diarrhoea or dysentery. In another paper in the same issue Captain Morison gives directions as to the dose of alum for the clarification of water by precipitation. For soft water the best dose is half the equivalent weight of alum necessary to react completely with the alkalinity calculated as calcium carbonate. For a hard water the same rule holds good; but an equally good clarification can be obtained by the use of a smaller dose and a mechanical filter. A watery solution of haematoxylin (logwood) gives a reddish colour when the correct dose has been used. With doses in excess or in defect of this a decoloration or a gradation of shades of purple or lavender is obtained; this reaction can be used for a colorimetric estimation of, and hence a check on, the dose of alum actually used. The clarification obtained by adding the optimum dose of alum was not affected by the turbidity of the water within the wide limits of turbidity found in the Poona water.

CANCER AND HOT DRINKS.

THAT the habit of drinking hot fluids—coffee, tea, and soups—so common throughout the temperate zone is the main predisposing cause of cancer of the oesophagus and stomach is the opinion of Dr. Lerche of St. Paul, Minnesota,[1] although he allows that alcohol and other irritating fluids may have the same effect. It seems clear that cancer of the oesophagus is extremely rare in animals and cancer of the stomach distinctly more frequent. These two local forms of malignant disease are alike rare in the natives of tropical and subtropical lands, and alike conspicuously frequent in certain countries

[1] A Contribution to the Etiology of Cancer of the Oesophagus of the Stomach, *Surgery, Gynecology, and Obstetrics*, July, 1916, p. 42.

temperate in climate and inhabited by so-called civilized man. Dr. Lerche lays stress on the fact that while cancer of the stomach occurs with almost equal frequency in both sexes, cancer of the oesophagus is much more frequent in males. The local effects of corrosive fluid, swallowed accidentally or for suicidal purposes, have long been familiar to pathologists. Cicatricial strictures develop along certain tracts in the oesophagus and stomach. Now Lerche maintains that clinical records agree in demonstrating how it is precisely these same tracts that are the usual seat of oesophageal and gastric cancer. A corrosive fluid passing along the course that all ingesta take in their descent along the alimentary canal burns the surface of the oesophagus and stomach at once, but hot drinks swallowed day after day for years irritate the same parts of the alimentary tract, just as the kangri basket full of burning charcoal irritates the skin of the abdomen of the Kashmir natives. Lerche ends with a less generally acceptable proposition. Cancer of the oesophagus is relatively rare in women because they drink more slowly and take smaller mouthfuls, which pass quickly downwards, sparing the oesophagus, while the less resistant mucosa of the stomach where the fluids come to a stop is more equally exposed in both sexes. Cancer of the stomach, Lerche notes, is almost equally frequent in both sexes.

GERMAN GAOLERS AND RUSSIAN PRISONERS.

ALTHOUGH the British prisoners in the hands of the Germans are treated with exceptional cruelty, they are not the only victims of the barbarity of that unchivalrous race. Senator Edouard Herriot, Mayor of Lyons, calls attention in *Le Journal* to their brutal treatment of Russian prisoners, and offers a large mass of documentary testimony from French witnesses in proof of his statements. Last winter the Germans made Russian prisoners work in their trenches in the regions of Rethel and Montmédy. "It would be impossible," says a doctor, "to give you an idea of the martyrdom of these poor soldiers, who had become tuberculous. I have had several under my care who died without any apparent disease; according to Russian doctors, who examined them, many succumbed to anaemia, while others were killed by French projectiles to which they were exposed." Russian prisoners are used in the training of dogs which guard the camps. They have to bear without resistance the furious attacks of the beasts set on them by the sentries; if they defend themselves they are tied to posts or shot. At Gastrow there were four deaths from hunger—a fact proved by autopsy. According to the same witness, the Russians receive no money, no letters, no food, and no clothing. Another French witness has seen half-famished Russians in the camp of Gross Poritch harnessed to heavily-laden carts like beasts of burden; they appealed in vain to the pity of their guards, and, when utterly exhausted, were sent to die in the lazaret. Some months ago Dr. Abramovitch, who was repatriated after a long captivity in the fortress of Küshin, wrote in the *Rousskia Viedomosti* that two-fifths of the Russian prisoners are doomed to death, while the others are threatened with complete physical breakdown. Russia does its best for the relief of these unhappy sufferers. Organizations have been formed at Moscow, Petrograd, and in the provinces, in connexion with Prince Galitzow's Committee and the Union of the Zemstvos, for the dispatch of supplies of all kinds. But as transport can only be made by sea and through Denmark and Sweden, communication is difficult. Therefore Russia has established centres for the sending of consignments at Berne and Lausanne, The Hague, Rome, and London. Eight months ago M. Herriot organized a service, under the presidency of Madame Isvolsky, for the relief of Russian prisoners, to co-ordinate the work of the Russian and French organizations. It has its headquarters in Paris and its centre for dispatches in Lyons. The Austrians are not less cruel than the Germans. Besides the privations and other miseries of prison camps, they punish the slightest breach of rules with extreme severity, tying the men's hands and feet, and hanging them by the wrists. In twenty minutes they lose consciousness. They are then cut down and revived by throwing water over them. The hanging is then repeated perhaps eight times, when the prisoner has to be taken to hospital, sometimes in a dying state. Among those records of barbarism it is pleasant to find evidence of the humanity of the British and French to their Russian fellow prisoners. The *Times* of August 12th published a communication from the Foreign Office giving the text of a deposition made before a member of the Russian Extraordinary Commission of Inquiry by Philipp Danilovich Ovcharenko, private in the 83rd Samursky Regiment, who had been a prisoner in the German town of Kwetlenburg. The Russians suffered much from hunger, and if the British and French had not shared with them the large quantities of food which they received many would have died. In spite of the cruel punishments meted out by the Germans to the French and British prisoners they continued to feed their Russian fellow captives secretly, and, thanks to their kindness and care, the prisoners survived to return to their native country.

CENTRAL WAR PENSIONS DISABLEMENT SUBCOMMITTEE.

A MEETING of the special Disablement Subcommittee of the Central War Pensions Committee has been held. The committee contains representatives of the Soldiers' and Sailors' Help Society and the Officers' Family Association, of the Admiralty and Army Council, of the National Insurance Joint Committee, of the Local Government Board and the Board of Agriculture, of the Labour Exchanges Department and of labour, and of the co-operative interest; there are seven other members, including, as the only medical representative, Sir Alfred Pearce Gould. Among the questions discussed at the recent meeting was a new regulation enabling maintenance to be paid to disabled men during training for employment in cases where the pension is insufficient to support the man and his family when the training necessitates absence from home, and thus increases his expenses.

Medical Notes in Parliament.

Alcohol in Military Hospitals.—Major Chapple asked a question on August 23rd with regard to the prescription of alcohol in military hospitals, and inquired whether, when alcohol was deemed by the medical officer to be beneficial to a case in hospital, it could not be prescribed through the hospital chemist in its medicinal form as set out in the *British Pharmacopoeia* and not in the form of a beverage. The Financial Secretary to the War Office said that the prescription of alcohol must be left to the discretion of the medical officer attending the case. It was not considered practicable to arrange for the supply of beer and such beverages through the hospital dispensary.

Vaccination of Naval Entrants.—Dr. Macnamara informed Mr. Snowden, on August 23rd, that the regulations of the Admiralty which required, on the advice of its medical officers, the vaccination of men and boys entering the navy were made under the authority of the Naval Enlistment Acts 1835 to 1884.

Cocaine and Unregistered Dentists.—The Home Secretary informed Mr. Raffan, on August 23rd, that the general permit to unregistered practitioners in dentistry to use solutions containing not more than 1 per cent. of cocaine for the purpose of their practice would be extended to October 15th. In a written answer to Mr. Keating, on the same day, he said that the German patent had been suspended and that novocaine was now being manufactured by a British firm.

Autumn Recess.—The House of Commons adjourned on August 23rd until October 10th.

IT was reported that, through the exertions of the British Ambulance Committee, there are now with the French army some 150 ambulances and 250 men of British nationality drawn not only from the United Kingdom, but also from Canada, Africa, New Zealand, Australia, Ceylon, and the Malay States. One Médaille Militaire and twenty-nine Croix de Guerre have been awarded to those serving.

THE WAR.

TREATMENT AND TRAINING OF WOUNDED MEN.

PROVISION FOR MUTILATED SOLDIERS IN LOMBARDY.

A RECENT number of the Italian Archives of Orthopaedics[1] gives an account of what is being done in Milan by the Lombardy Committee to supply the artificial limbs required by Italian soldiers mutilated in the war and to educate them in the use of the various forms of apparatus supplied. The matter was taken in hand early in 1915. In the summer of that year it was decided to convert the Istituto dei Rachitici of Milan into a Reserve Hospital for Military Orthopaedics, with the help of various organizations in Milan and Lombardy. The hospital consists of two parts: One, the Istituto dei Rachitici, in Milan, is the surgical and orthopaedic portion; it contains 70 beds for soldiers, with facilities for all sorts of surgical and mechanical treatment, and was at work in August, 1915. The other section, the Refuge of Gorla Primo, recently founded by Signora F. F. Ottolenghi, near Milan, contains about 100 beds, and is employed for the re-education of the convalescent mutilated soldiers; temporary buildings to lodge a further hundred men have been erected in the ornamental grounds of the Refuge. All the hospital patients are under military discipline, and remain in the hospital until they have made the maximum improvement possible; permanent invalids and those who do not profit by the education given are not kept. The chief surgeon is Professor R. Galeazzi, with the military rank of major. The artificial limbs and mechanical appliances required by the patients are all made, as they were for the civil patients before the war, by the hospital staff, on the spot and under the eye of the surgeons in charge of the cases; presently, however, the matter of supplying artificial limbs and apparatus will be taken over by an Officina Nazionale di Protesi, or national prothetic workshop, at Gorla. The necessary funds for all this work have been furnished partly by local generosity, partly by Government grants, and partly by the contribution from the Minister of War of 3½ lire a day for each soldier. This minister has concluded with the hospital an agreement of sixty-eight articles regulating its management, which is printed in full. It appears from a paper read to the Lombardy Committee on October 29th, 1915, that the F. F. Ottolenghi Refuge is the first school for the education of the wounded to be started in Italy. It has been modelled on the similar French schools at Lyons, Paris, Bordeaux, and other important towns, which were specially visited by the Milanese authorities. It is calculated that about 80 per cent. of the severely mutilated soldiers can be re-educated satisfactorily; 45 per cent. returning to their full previous powers of earning, 20 per cent. returning to a larger or smaller fraction of their former worth, and 15 per cent. being rendered capable of entering certain minor employments where no great strength or skill are required.

THE BELGIAN INSTITUTE FOR DISABLED SOLDIERS AT VERNON.

The Belgian Institute for the re-education of crippled soldiers at Vernon, which forms part of the Belgian scheme for disabled soldiers described in the JOURNAL of August 12th, p. 236, stands on a site at an elevation of 150 metres above the Seine. It has accommodation for 1,200 men in eighty huts, similar in design to those of the British hutted hospitals. Forty-eight trades are taught. The output of the school during the twelve months of its existence is valued at £38,000. In addition to the industrial work, land to the extent of thirty hectares is cultivated; the value of the produce up to the present time is estimated at £4,000; the school has produced all the vegetables and fruit required for its own use. A poultry farm produced since March, 1916, three thousand chickens. Pigs have already yielded a profit of £200, and three hundred rabbits have been secured for breeding. There are thirty colonies of bees. Gardens around the workshops are used for the teaching of horticulture, and for the growth of flowers under glass.

[1] *Archivio de Ortopedia*, Milan, 1916, xxxiii, f. i.

CASUALTIES IN THE MEDICAL SERVICES.

ARMY.

Killed in Action.

ASSISTANT SURGEON PETER CLEMENT D'CRUZ, of the Indian Subordinate Medical Department, has been reported as killed in action. He was born on February 23rd, 1889, and became fourth class assistant surgeon on April 17th, 1911. Previous to the war he was stationed at Mombasa, in British East Africa, so presumably was killed in the campaign in German East Africa. He is the third member of I.S.M.D. to be killed in that province.

Died of Wounds.

Captain Owen Herbert Peters, R.A.M.C.(T.F.), was reported as wounded in the casualty list published on August 4th, and in that of August 21st as having died of his wounds. He was educated at Melbourne University, where he graduated M.B. in 1902 and B.S. in 1903; he took the D.P.H. of the London Colleges in 1906, and before the war was working in the health department of the London County Council. He joined the 2nd London Sanitary Company as lieutenant on May 7th, 1915, and was promoted to captain on completion of a year's service.

Died on Service.

Major Norman Ernest Jasper Harding, R.A.M.C., died of cholera in the Colaba Military Hospital, Bombay, on August 10th, while in command of a Stationary Hospital there. He was born on February 2nd, 1875, and educated at University College, Liverpool, and in the University and Extramural School at Edinburgh, where he graduated M.B. and Ch.B. in 1900; he took the diploma in tropical medicine in the same year. He served as a civil surgeon in the South African war, in which he was severely wounded, gaining the Queen's medal with two clasps, and the King's medal. He entered the R.A.M.C. as a lieutenant on September 1st, 1902, becoming captain on March 1st, 1906, and major on June 1st, 1914. Previous to the war he had served in Burma, in India, and the West Coast of Africa. He was the author of a paper on the value of Koch's treatment of malaria (*Journal of R.A.M.C.*, 1908), and of numerous other historical and professional articles. He went to France with No. 12 General Hospital at the beginning of the war in 1914, and served in that country for fifteen months, before taking to India the unit which he was commanding at the time of his death. In 1908 he married Dorothy, eldest daughter of the late Mr. Ernest Wotton, of Maidstone, and of Kobe, Japan.

Captain Milward Cecil Hayward, R.A.M.C.(T.F.), died of acute septic pneumonia at the Howard Home, Brighton, on August 25th. He was the son of the late Mr. Henry Howard Hayward, of Queen Anne Street, London, and was educated at Cambridge and Guy's Hospital. He graduated B.A. in 1893, M.A. in 1898, and M.B. and B.C. in 1903. He also took the M.R.C.S. and L.R.C.P.Lond. in 1898. After filling the posts of clinical clerk at the Samaritan Hospital for Women, house-surgeon and house-physician at Paddington Green Children's Hospital, and resident medical officer of the North-West London Hospital, he went into practice at Abingdon. He joined the 3rd Home Counties Field Ambulance as lieutenant on December 3rd, 1914.

Captain H. H. Tanner, R.A.M.C. (temporary).
Lieutenant W. W. Farrer, R.A.M.C. (temporary).

Wounded.

Captain H. S. Baker, R.A.M.C., S.R.
Captain F. A. Bearn, R.A.M.C., S.R.
Captain R. D. B. Frew, R.A.M.C.(T.F.).
Captain A. S. Glynn, R.A.M.C. (temporary).
Captain R. McC. Hill, D.S.O., R.A.M.C. (temporary).
Captain S. M. McLay, R.A.M.C. (temporary).
Captain A. F. Menzies, R.A.M.C. (temporary).
Captain N. M. Rankin, R.A.M.C. (temporary.
Captain H. K. Ward, R.A.M.C., S.R.
Captain A. Watson, R.A.M.C.
Lieutenant C. P. S. Allingham, R.A.M.C. (temporary).
Lieutenant T. J. Lloyd, R.A.M.C. (temporary).
Lieutenant W. J. Macknight, R.A.M.C. (temporary).
Lieutenant P. L. Watkin-Williams, R.A.M.C. (temporary).

Prisoner of War.

The name of Lieutenant P. E. O'Donoghue, Indian Subordinate Medical Department, has been added to the list of prisoners taken at Kut in April.

DEATHS AMONG SONS OF MEDICAL MEN.

Bass, Charles Brodie, Second Lieutenant Alexandra Princess of Wales's Own Yorkshire Regiment, son of Charles William Bass, M.R.C.S., of 25, Perham Road, West Kensington, reported wounded and missing on September 27th, 1915, now presumed to have been killed on that date on Hill 70. Before the war he was private secretary to Lord d'Abernon, of the Dominions Royal Commission. He got his commission on December 12th, 1914, and went to the front on September 10th, 1915.

Cockey, John E. P., Second Lieutenant King's Liverpool Regiment, only son of Dr. E. Cockey, of Frome, Somerset, recently reported as missing, and subsequently as killed. He was educated at the King's School, Worcester, where he was a King's Scholar.

Goudie, Humphrey, Lieutenant Cameron Highlanders, son of the late Dr. Goudie, of South Shields, killed recently. He had not long ago been decorated with the Military Cross.

Layng, George Reginald Stuart, Lieutenant Gloucestershire Regiment, third surviving son of the late Dr. Henry Layng of Swatow, China, killed on August 13th, aged 20. He was educated at Abingdon School and at Cheltenham College, and in 1913 was articled to Messrs. Winterbotham and Gurney, solicitors, Cheltenham. At the beginning of the war he enlisted in the Public Schools Battalion, got a commission on January 14th, 1915, and went to the front last October.

MacNeece, James Douglas Gaussen, Captain Royal Field Artillery, second son of Colonel T. F. MacNeece, Army Medical Staff (retired), of Castlecary, Donegal, killed on August 10th, aged 25. He was educated at Cheltenham College, where he was senior prefect and captain of football in 1909. He also played football for the Royal Military Academy and for Blackheath. He got his commission from Woolwich in August, 1911, was promoted to lieutenant on July 20th, 1914, and recently to captain, and was commanding his battery when killed. He was mentioned in dispatches, and received the Military Cross in February, 1915.

Marshall, Arthur Norris, Second Lieutenant Bedfordshire Regiment, son of the late Dr. W. N. Marshall, of Newent, Gloucestershire, killed on July 31st, aged 19. He was educated at Dean Close School, Cheltenham, where he was in the O.T.C., afterwards entering Lloyd's Bank. He got his commission in June, 1915, and went to the front in November.

Rainsbury, Finn Barre Prendergast, 21st Royal Fusiliers, eldest son of Dr. W. C. Rainsbury, of Skegby, Nottinghamshire, killed on July 22nd, aged 20. He was an undergraduate of the University of Dublin. He enlisted early in 1915. He had been severely injured in Flanders at the end of last year.

Sansom, Walter Edwin Hammond, Second Lieutenant King's Own Royal Lancaster Regiment, son of Dr. Sansom, of Barrow-in-Furness, killed on August 17th, aged 19. He was educated at Rossall and at Edinburgh University, where he was studying medicine, and got his commission on December 7th, 1914.

NOTES.

CLASPS FOR D.S.O. AND M.C.

ROYAL WARRANTS gazetted on August 26th ordain that any one who, after having performed services for which the Distinguished Service Order or the Military Cross is awarded, subsequently performs an approved act of gallantry which, if he had not received the Order or the Cross, would have entitled him to it, shall be awarded a bar, to be attached to the ribbon by which the Order or the Cross is suspended, and for every additional such act an additional bar may be added. It is further ordained "that the Military Cross shall not confer any individual precedence, but shall entitle the recipient to the addition after his name of the letters M.C." The insertion of the letters will be carried out in the *Army List* for October.

HONOURS.

THE *London Gazette* of August 25th announces the names of thirty-eight officers on whom the D.S.O. has been conferred, and of 234 who receive the Military Cross. Among the former there are three, and among the latter eighteen medical officers. Their names are given below.

D.S.O.

Temporary Lieutenant Hugh Llewellyn Glyn Hughes, R.A.M.C. For conspicuous gallantry and devotion to duty during operations. He went out in broad daylight, under heavy fire, and bandaged seven wounded men in the open, lying out in an exposed spot for one and a half hours. At nightfall he led a party through a heavy barrage and brought the seven men back.

Temporary Captain Douglas William Hunter, M.B., R.A.M.C. For conspicuous gallantry in action. He tended the wounded incessantly in the open and in the front line trench under very heavy fire.

Temporary Captain Henry Harold Robinson, R.A.M.C. For conspicuous gallantry and devotion to duty. After a raid in the enemy's trenches, he twice crawled out in broad daylight to assist wounded men under fire. They were brought in at night.

Military Cross.

Temporary Captain Archibald Stirling Kennedy Anderson, M.B., R.A.M.C. For conspicous gallantry and devotion to duty in action. He was untiring in attending to the wounded, though on more than one occasion his aid post was struck by shells. He went out under heavy shell fire to the assistance of the wounded.

Captain William Barclay, M.B., R.A.M.C.(S.R.). For conspicuous gallantry and devotion to duty when in charge of a bearer division during operations. He worked often in the open under heavy shell fire, and set a fine example to all under him.

Temporary Lieutenant James Roberts Boyd, M.D., R.A.M.C. For conspicuous gallantry and devotion to duty when rescuing, under heavy fire, some men who had been buried in their dug-out. He assisted in the digging out, although temporarily disabled by earth thrown up by a bursting shell, and finally brought in one man alive.

Temporary Captain Michael Charles Burke, M.D., R.A.M.C. For conspicuous gallantry and devotion to duty in action. He worked incessantly with practically no rest for seven days under shell and machine-gun fire. He greatly encouraged all those round him by his cheeriness and disregard of danger.

Temporary Lieutenant Charles Bromley Davies, R.A.M.C. For conspicuous gallantry and devotion to duty in action. When commanding stretcher bearers, although himself wounded, he continued his gallant work with practically no rest for six days.

Temporary Captain James Churchill Dunn, R.A.M.C. For conspicuous gallantry and devotion to duty in action. He showed an utter disregard of personal danger, and his bravery when tending the wounded was the admiration of all ranks.

Temporary Captain Ernest Harrison Griffin, M.D., R.A.M.C. For conspicuous gallantry and devotion to duty. Without food or sleep he worked incessantly tending the wounded of his own and other units under heavy fire. He showed an absolute disregard of danger. On other occasions he has done similar gallant work.

Captain Henry Alphonsus Harbison, R.A.M.C.(S.R.). For conspicuous gallantry and devotion to duty in action. When in charge of stretcher bearers he dug out a man under heavy fire and brought him safely back. He also repeatedly took out parties under heavy fire and evacuated a wood of all wounded.

Captain William Johnson, M.D., R.A.M.C.(S.R.) For conspicuous gallantry and devotion to duty. He led the bearer division of his unit for seven consecutive days during heavy fighting. He was repeatedly under heavy fire when rescuing the wounded. He has always set a fine example of courage.

Temporary Captain James Reginald Kemp, R.A.M.C. For conspicuous gallantry and devotion to duty in action. For several days he was indefatigable in bringing in and tending the wounded, and undoubtedly saved many lives.

Captain George Herbert Hind Manfield, R.A.M.C. For conspicuous gallantry and devotion to duty in action. He worked day and night tending the wounded in our advanced positions under heavy fire, and carried many of them down the trench after all his bearers had been wounded.

Temporary Captain Valentine Cleeve Martyn, R.A.M.C. For conspicuous gallantry and devotion to duty when tending the wounded under fire. On several occasions he has gone out under circumstances of the greatest danger, but has never hesitated to take any risk in order to reach a wounded man.

Temporary Captain John Boyd Orr, R.A.M.C. For conspicuous gallantry and devotion to duty in action. On several occasions he displayed the greatest courage when searching for and tending the wounded.

Temporary Captain David Pottinger, M.B., R.A.M.C. For conspicuous gallantry and devotion to duty in action. When in charge of stretcher-bearers he showed an utter disregard of danger, and, though himself wounded in the face, continued his gallant work during the remainder of the day.

Temporary Captain Clive Watney Roe, R.A.M.C. For conspicuous gallantry and devotion to duty during three days of hard fighting. He was indefatigable in tending the wounded, and displayed great coolness under fire.

Captain Joseph Wilkie Scott, M.D., R.A.M.C. For conspicuous gallantry and devotion to duty in action. He tended the wounded under heavy fire for several hours, and carried back a number of them to our front line at great personal risk.

Temporary Captain John Henry Tomlinson, R.A.M.C. For conspicuous gallantry and devotion to duty during a heavy bombardment. He tended the wounded in the main street of a village at great personal risk till he was severely wounded by a fragment of a shell.

Captain Fergus McIntyre, Australian A.M.C. For conspicuous gallantry and devotion to duty under heavy artillery fire during operations. The aid post received a direct hit from an enemy shell.

THE General Education Board of New York is undertaking what we believe to be a novel inquiry. A great deal has been done to estimate the degree of defect in deficient children, but the board has now appointed Professor Whipple, of the University of Illinois, to endeavour to find out how early in school life gifted children can be spotted, how much of their school time and energy can be economized, and how much additional training and mental equipment can be obtained during their school years.

Scotland.

ADMISSION OF WOMEN MEDICAL STUDENTS TO UNIVERSITY CLASSES IN EDINBURGH.

THE Court of the University of Edinburgh at its meeting on August 28th resolved to admit women this winter session to all the medical classes, systematic and practical, in the university. The systematic lectures in midwifery and gynaecology will be given separately to men and women students, and possibly also those in materia medica, but in all other subjects the classes will be mixed. There will be separate sections for women in all practical courses, except in advanced courses, and in special cases that may be arranged by the head of the Department. Women will be admitted to university clinical instruction so soon as arrangements can be made. They are now under consideration, and it is expected that by next year women students will be able to take their whole curriculum within the university.

EPIDEMIC ANTERIOR POLIOMYELITIS.

Dr. Watt, medical officer for Aberdeenshire, reported to the Deeside district committee on August 26th that five or six cases of anterior poliomyelitis had occurred in the county, and that there was an outbreak in Fraserburgh, comprising five cases. Altogether sixty-six cases had, he said, occurred in the city of Aberdeen, but the disease usually declined in cold weather, and appeared to be decreasing now. The committee decided to add infantile paralysis to the list of compulsorily notifiable diseases.

INFANT WELFARE SCHEME, DUNDEE.

The Public Health Committee of Dundee has approved a scheme for an infant welfare organization in the city, and intends to advertise for a doctor at a salary of £300 a year. The convener of the committee said that it had been learnt that no one who was a member of the British Medical Association would take the position under £350 a year; the M.O.H. (Dr. Templeman) said that that was now the recognized minimum for a medical woman at the head of an infant welfare scheme. The committee, however, resolved to advertise the appointment at a salary of £300.

A MILITARY ORTHOPAEDIC DEPARTMENT.

The report of the first six months' work in the orthopaedic department at Woodside Red Cross General Hospital, Glasgow, has been issued. The cases treated included wounds, contusions, fractures, dislocations, sprains, synovitis, arthritis, periostitis, rheumatism, myalgia, lumbago, and neuritis and other nervous affections. In all, 217 soldiers received treatment, and the majority have recovered sufficiently to return to their units. Only about 10 per cent. have been discharged as unfit for active service, but all of them were able to use all their limbs. The means employed include massage, exercises, electricity, and the Dowsing radiant heat and light apparatus. Remedial exercises carefully selected to suit the capacity of the individual, and gradually increased in difficulty so as to ensure systematic progress, have proved very useful.

MINERS AND DOCTORS' FEES.

A conference of the Colliery and Public Works Surgeons' Committee for Scotland and the Executive of the National Union of Scottish Mine Workers was held in Edinburgh on August 25th to consider the following proposals:

1. The proposal by the miners that the doctors should accept a new contract at the rates of 2d. without and 2½d. with medicine per week per worker.
2. The proposal by the doctors that the miner should pay each week at the works the sum of 2½d. without and 3d. with medicine, or, alternatively, that the parties should refer the whole question to an arbiter to fix a fair rate.

The Colliery and Public Works Surgeons' Committee reported that the medical practitioners throughout the whole areas unanimously rejected the miners' proposal. It was announced for the miners that the counties of Lanark, Dumbarton, Stirling, and West Lothian had voted in favour of amending the rates to 2½d. without and 3d. with medicine, but that the areas of Clackmannan, Kinross, Fife, and Mid and East Lothian were against any increase of the present rates, and refused to refer the matter to arbitration. The Colliery and Public Works Surgeons' Committee stated that the offer of the miners in the areas mentioned to pay 2½d. without and 3d. with medicine would be accepted in those areas, but that in the event of the same improved terms not being arranged within six weeks in the other areas, the doctors would give notice to terminate, and would terminate, the new contract.

THE INCORPORATED SANITARY ASSOCIATION OF SCOTLAND.

The forty-second annual congress of the Incorporated Sanitary Association of Scotland is to be held in Edinburgh from September 6th to 8th. The annual business meeting will take place on the evening of September 6th, and will be followed by a popular lecture on the Hairmyres Colony scheme of graded labour for the cure of tuberculosis by County Councillor George Fraser. On the morning of September 7th the Congress will be opened by Sir Robert Kirk Inches, Lord Provost of Edinburgh, and Dr. Alexander Robb, M.D., C.M., D.P.H., County Medical Officer for Midlothian, Linlithgow, and Peebles, will give his presidential address, the subject being "After the War." The rest of the day will be given to the discussion of infant and maternity welfare schemes under the Notification of Births (Extension) Act. The subject will be divided into sections as follows: The discussion of the care of the mother before the birth of her child will be introduced by Dr. J. W. Ballantyne, and he will be followed by Sir J. Halliday Croom and Dr. Haig Ferguson; Miss Mary E. Cairns will then read a paper on the place of the midwife in infant welfare schemes; Mr. John Halliday will speak of the unregenerate and the degenerate parent; Mrs. Leslie Mackenzie will introduce the subject of the linking up of child welfare schemes with schemes of school medical inspection and treatment; Dr. Mary J. Menzies will deal with some administrative aspects of child welfare schemes; and Sir George Thomas Beatson, M.D., K.C.B., will discuss the necessity for a central association with affiliated or branch committees for carrying on instruction in infant hygiene and feeding so as to furnish a good supply of suitably qualified teachers. September 8th will be mainly devoted to a discussion on tuberculosis, and there will also be a discussion on the outbreak of diphtheria associated with the milk from certain farms, with diphtheritic sores on the knuckles of milkers, and with sores on the udders and teats of certain cows at the farms from which the milk was obtained. Finally, the economic aspects of the housing problem in relation to the war will be discussed. The meetings will be held in St. Cuthbert's Hall, Edinburgh. The secretary is Mr. Geo. Middleton, 83, Bath Street, Glasgow.

England and Wales.

THE REFRESHMENT HOUSE EXPERIMENT IN CARLISLE.

THE Central Liquor Control Board is continuing and extending its experiment at Carlisle. Last week it acquired another brewery and eleven more of the licensed premises in the city, making a total up to date of two breweries and sixty-one licensed houses. There has been, it is stated, a great increase in the bottle trade, due, in part at least, to workers living at Gretna and in the surrounding districts purchasing bottled beer and spirits in Carlisle to take home with them. The Board is now preparing to take over the premises of a firm of wine and spirit merchants, with the intention of making them the chief distributing centre for the bottle trade in Carlisle. The intention of carrying out this policy was announced when the scheme was first put in force, and the premises now about to be acquired are within a few yards of Gretna Tavern, the model refreshment house described when we last referred to this matter (July 8th, 1915, p. 59). The tavern itself, it is said, has failed to attract the workmen from Gretna who come into the town, except on Sundays when it is the only refreshment house open in the city. The convictions for drunkenness in Carlisle were 139 in June and 91 in July. In the first three weeks of August they numbered 41. Opinions differ as to the cause of this diminution, but many attach a great deal of importance to the fact that the new population of Gretna is changing its character. The constructional work which at first attracted navvies is now more or less completed, and the men are going elsewhere,

their places being taken by artisans. The navvies, it is said, were of an extremely rough class, given to a weekly carouse, whereas the artisans are of a superior class, and better behaved. It is probably too soon as yet to draw any general conclusions from the experiment, but we are informed that the impression is that so far the result has been satisfactory. Meanwhile the housing problem in Carlisle is very acute. The provision of small houses was insufficient before the war, and the influx of munition workers has greatly aggravated the difficulty.

Correspondence.

THE REPORT OF THE ROYAL COMMISSION ON VENEREAL DISEASE.

Instruction of the Young.

SIR,—The report of the Royal Commission on Venereal Diseases has raised again the problem of the instruction of the young in these matters. Knowledge, especially such as can be given to schoolboys, does not necessarily save, but ignorance greatly enhances risk.

If progress is to be made we must learn by experience. Systematic instruction has been given for about twenty years in many schools; in one, with which I have been connected, after instruction was introduced, the known cases of masturbation fell in two years from 62 per cent. to 24 per cent.; the authorities doubtless did not know all at either stage, but there is no reason to suppose any great variation in ratio between the known and the unknown. There are things which all boys should know; almost all welcome instruction when given sanely and privately, and far more go wrong than is generally supposed.

It has been from time to time suggested that instruction should be given (1) by mothers—they can do much to safeguard a boy's early years, but cannot generally carry him effectively beyond childhood; (2) by fathers—but they almost universally neglect it; (3) by the dissemination of literature—but the satisfactory pamphlet remains to be written, and in my experience more harm than good is done by this method. Instruction is given at most "public" schools by head master or house masters, at many preparatory schools, and at a few day schools. The problem, so far as my knowledge goes, is almost entirely neglected in schools of the "secondary" or "grammar school" type, apart from dealing with occasional scandals, though in a few it has been handled with remarkable results. These schools, with the public elementary schools, account for the vast majority of boys in the country, and the gravity of the danger may be judged by the fact that two boys came recently to the preparatory department of a public school from good homes, understanding at the age of 10 the use of "French letters." Something, but by no means enough, is done by the clergy in confirmation classes and by scout-masters.

The best results are obtained by private and individual conversations, as different boys require very different handling; normally, two conversations at about 10 and 15 are enough; too much probing defeats itself. Where this is impossible as, presumably, in public elementary schools, class instruction must take its place, but this requires to be given with very great care, and shares with literature the drawback that it stimulates talk in which the prurient always take the lead.

The educational profession has done about as much as it can in informing public opinion; if a comprehensive national policy is to be inaugurated the lead must be given by the medical profession. This might be done in three ways: (1) By a strongly-worded and widely-circulated memorandum insisting on the paramount need of instruction in every case; (2) by the organization of a system of instruction in all schools aided by the State or local authorities; (3) by making it the duty of every general practitioner to advise the father and instruct, with his consent, the boys of every family he attends.

To one who knows how much is done by the school doctor in a "public" school it is little short of amazing to find that the family doctor has, with very few exceptions, never either directly or indirectly warned a boy before he comes to school.—I am, etc.,

August 23rd. A PUBLIC SCHOOL MASTER.

NITROUS OXIDE-OXYGEN ANAESTHESIA.

SIR,—The administration of anaesthetics is not in my line of practice, but I have always taken an interest in the subject from my house-physician days, when I administered chloroform frequently and freely by the Scottish method—with a towel. I also had the advantage of serving on the Chloroform Committee. The above must be my excuse for venturing to interpose any remarks on this subject.

The fact that two deaths have occurred after the administration of a mixture of nitrous oxide and oxygen in the hands of two such able anaesthetists as Dr. McCardie and Dr. Robinson must arrest public attention. The fact that two deaths have occurred, to my mind, need cause no surprise, but why the deaths have not been more numerous is a point which requires some explanation.

It seems to me that in the administration of any general anaesthetic it is most important that the activity of the respiratory centre should be maintained. The natural and best stimulant for this centre is carbonic acid, but this method of hyperoxygenation, so highly vaunted, is the one best calculated to throw the respiratory centre out of action and bring on a fatal apnoea, which is further accentuated by frantic efforts at artificial respiration. It appears to me that the reason why this fatal apnoea has not been frequent, and, consequently, the mixture of oxygen and nitrous oxide relegated to the limbo from which it should never have emerged, arises from the facts, first, that it is difficult to get the blood to take up more than a definite amount of oxygen; and, secondly, with a closed inhaler the carbonic acid tension as a rule does not fall too low unless there be a state of collapse and the metabolism be very low. The old closed ether inhaler might half suffocate the patient, but it never induced a fatal apnoea. I would rather see an anaesthetized patient purple and the respiratory centre acting, than a normal colour and a tendency to apnoea. Anaesthetists before adopting any method likely to induce apnoea should study the work of Dr. Yandell Henderson. Personally I should never allow any one, no matter how experienced, to administer a mixture of oxygen and nitrous oxide to myself or to any of my friends if I could help it.—I am, etc.,

Liverpool, Aug. 29th. JAMES BARR.

SIR,—The account of a death under nitrous oxide and oxygen and spinal anaesthesia published in your issue of August 26th, 1916, by Dr. W. E. Robinson, is highly instructive.

It is, of course, always difficult to criticize from a mere description of events, but there are one or two points that occur to me:

(*a*) Why give both stovaine and nitrous oxide and oxygen? If the spinal anaesthesia is going to be satisfactory, why the need for nitrous oxide and oxygen? If the spinal anaesthesia is not going to be a success, why give it at all?

(*b*) I observe that Dr. Robinson apparently does not have any means of regulating the flow of gases into his bag, but changes the mixture "about every five minutes." Now this, if I understand Gwathmey aright, is not a satisfactory method of administering the mixture. He insists on a regular flow of gases, the percentage of which can be altered in a moment at the will of the anaesthetist.

(*c*) I am rather puzzled to know quite what Dr. Robinson means by "the regular snoring breathing." Does he mean "stertorous"? But he cannot mean that because, according to Gwathmey, "the symptoms of an overdose of nitrous oxide in the presence of sufficient oxygen to keep the patient pink is, first, stertorous respiration . . . ."

(*d*) I do not quite understand why the second attack of vomiting is put down to the stovaine. May it not have been on account of excessive rebreathing? This, as Gwathmey points out, and as I myself have observed, is a frequent cause of vomiting, until one has learnt how much rebreathing each patient will stand—a matter that experience alone can teach.

The prolonged administration of nitrous oxide and oxygen with rebreathing—and with a little ether, if necessary, to produce complete relaxation—is (at any rate in this country) in its infancy, and reports like those of Dr. McCardie and Dr. Robinson are highly valuable and instructive. There can be no question as to the value of this method from the patients' point of view, for their condition after the operation is infinitely better than with any of the other methods of anaesthetization that were usually in vogue in this country.

I have recently been giving nitrous oxide and oxygen with a Gwathmey apparatus, and have no hesitation in

saying that the cases that have been so anaesthetized have been far more comfortable after the operation than they were with other methods. As an instance let me cite two cases:

1. An officer had a semilunar cartilage removed under nitrous oxide and oxygen. The operation was finished at 5.30 p.m., and he had his dinner in comfort at 7.30 p.m.
2. A lady with varicose veins. Operation one hour; finished at 9.45 a.m. I saw her at 12 noon, and she said she felt perfectly fit, and could she have some lunch?

One has only to compare results like these with the ordinary condition of patients after the usual anaesthetic to see what a great deal we owe to men like Gwathmey and Teter for bringing this method to such perfection as has already been reached.

In conclusion, I hope that Dr. Robinson will not consider that my criticisms are made in any carping spirit; on the contrary, I make them because I want to know as much about this method as it is possible to know, for I am convinced that it is our duty as anaesthetists to do everything we can to alleviate the undoubted sufferings of our patients after ordinary general anaesthesia.—I am, etc.,

London, W., Aug. 26th. H. EDMUND G. BOYLE.

THE TREATMENT AND TRAINING OF WOUNDED MEN.

SIR,—The treatment of disabled soldiers in command dépôts and similar institutions is clearly described in the JOURNAL for August 12th, and the objects of treatment are summarized.

Major McKenzie speaks of three classes of patient, of whom the third contains those who are expected, with treatment, to be recovered within six months. May I suggest that there is a fourth class, very similar to the third in type, but differing in degree, and therefore requiring more than six months' treatment? These men, with injuries to bones, joints, muscles, and nerves—particularly the last—require thorough and careful treatment for a long time. They can only get it from a specialist, or his out patient department in one of the bigger hospitals, and there are not many with suitable equipment throughout the country; yet such a man is boarded out of the service, and his future treatment then depends on his own patience, perseverance, and optimism, and still more on his living within reach of such treatment and being able to afford the time usually necessary for a course of out-patient attendances.

His is not a case that can be benefited by his panel doctor, nor yet by the massage he might get from a kindly village nurse. If he is fortunate enough to live near a large hospital he can get treatment if he will, but is it right that damage done in the service of the State should be repaired at the expense of private charity? Further, is it fair to the taxpayers, or to the soldier himself, that he should eke out an existence on a poor pension when by reasonable attention he might be enabled to work and support himself?—I am, etc.,

Epsom, Aug. 23rd. NOEL H. M. BURKE.

THE CHEMIO-THERAPEUTICS OF MR. McDONAGH.

SIR,—I wish to thank Professor W. M. Bayliss for the trouble he has taken in offering criticisms upon my work, although they aim at being destructive. When I introduced the subject of chemio-therapy for discussion I did so with the intention of showing that Ehrlich's views were untenable, and that the theory of oxidation and reduction would better explain the phenomena observed. As we learn more it is probable that a still simpler explanation may be forthcoming, and I should not be at all surprised to find that certain physical properties possessed by the hydroxyl and hydrogen ions will explain all.

The serum contains colloidal particles which vary in number and size in different diseases. These particles are kept in "solution" by the normal hydrogen ion concentration, any upset of which alters their physical state. These particles, in my opinion, differ only from the colloidal particles of cells in that the former are free, while the latter are contained in a cell membrane. In other words, the colloidal particles in a syphilitic serum, in plasma cells in a case of syphilis, in the urine of so-called syphilitic albuminuria, and in the syphilitic parasites are as nearly as possible identical. They all possess amino and carboxyl groups, which regulate permeability: salts, and oxidizing and reducing ferments. These oxidizing and reducing ferments are intimately bound up with the normal hydrogen ion concentration, since any upset thereof destroys both complement and the ferments. The colloidal particles in a syphilitic serum are more numerous and larger than those in a normal serum. This observation gives us the rationale of the Wassermann reaction, and explains why chemio-therapeutic agents are more active in syphilis than in other diseases.

Since oxidizing ferments appear to be dependent upon metals, of which iron is the one to functionate in the human body, and reducing ferments upon non-metals such as sulphur, I tried to prepare some sulphur and iron compounds, which would readily permeate the particles and supply the non-metal and metal required for their oxidizing and reducing action. When I found that sulphur and iron had a marked therapeutic action in syphilis, it was reasonable to suggest that arsenic acts as an oxidizer, and that the employment of salvarsan only fulfils half of the chemio-therapeutic programme, since no reducing agent is employed. Intramine is particularly efficacious, since, owing to its amino groups, it is readily taken up by the particles in question. The first iron body I experimented with was ferric hydroxide, then with ferrivine, which was more powerful. I have already pointed out that the action of ferrivine is inconstant, because the iron is not directly attached to the benzene rings. Experiments are now in hand to achieve the object desired.

Since the paper (column 3, line 8) referred to was written I have repeated some of my former experiments, and have succeeded in demonstrating that the particles contain oxidizing and reducing ferments. The experiments were undertaken with dyes, as I am aware of no other method used for detecting these ferments. Drury's paper has only recently been published, and I have not yet been able to see it, consequently I am unable to judge whether Unna or Drury is right.

Under the ultra-microscope serums and colloidal suspensions present many similarities; therefore to compare the adsorptive capacity of a rigid body like charcoal with one of the former seems to me to be quite beside the point. For staining *in vivo*, although alcoholic solutions of dyes may be used, I expressly stated that the best and therefore the dye most to be recommended, was borax methylene-blue.

Professor Bayliss does not seem to realize that in the dried films only the dye is dried, while the cells in the examined secretion remain alive for several hours.

In my book I was careful to draw attention to the secret methods of preparing "606," and I cannot see how Professor Bayliss can make out that I have some secret method of preparing intramine and ferrivine. All these chemio-therapeutic compounds are colloids; therefore, although several samples may be chemically the same, their physical action may be quite different.

I am surprised to see in Professor Bayliss's remarks about intramine that he fails to acknowledge the help of one drug's action upon that of another. In my book I reported cases which immediately improved under intramine, although they had been uninfluenced by salvarsan and mercury. Why has Professor Bayliss not quoted one of these?

According to Professor Bayliss's reasoning, a simple explanation would be that salvarsan and mercury are useless, while intramine is a valuable remedy. For the past nine months I have been experimenting with colloidal iodine, and have found that it increases both the action of salvarsan and intramine. I have given so many injections of these different remedies that I am convinced that drugs can be employed which mutually increase the therapeutic effect obtainable by either one alone. Considering the exact formula of ferrivine is given, the accusation against me of using mystifying nomenclature falls to the ground. It is extraordinary for Professor Bayliss to state that "it is extremely unlikely that such a compound (ferrivine) would have any special action different from an ordinary ferric salt." In the first place, an ordinary ferric salt is non-colloidal, while ferrivine is; and, in the second place, I should not have advocated ferrivine if ferric hydroxide was as good. It is odd that Professor Bayliss failed to note my remarks concerning the therapeutic action of ferric and aluminium hydroxide.

I find that Professor Bayliss's only argument against me rests on the fact that I have used certain technical terms in a sense which does not meet with his approval. No argument has been brought forward to disprove my theories.—I am, etc.,

J. E. R. McDONAGH.

London, W., Aug. 18th.

*** This further letter from Mr. McDonagh is published in order that there may be no semblance of unfairness to him, but as the profession has now ample material for forming a judgement both on his theories and their outcome in drugs it is not proposed to continue this correspondence.

THE FASTING TREATMENT OF DIABETES.

SIR,—I accept Dr. Cammidge's explanation for not having referred to my paper with much less hesitation than his explanation of the "carbohydrate" content of turnips. He asserts that pectose is not turned into a sugar; this is not accepted by all. I hope to decide the question by making observations on patients who offer themselves for investigation. But even if it were assumed that pectose is not absorbed or transformed, it must be noted that Atwater and Bryant record 4.4 per cent. sugar in a specimen of turnips. A single observation showed me that boiled turnips may contain 2 per cent. of a substance which upon boiling with dilute acid turns into a body which may be fermented with yeast.

My contention is that when the carbohydrate tolerance is low, and whilst determining the tolerance, it is unwise to give foods the true carbohydrate content of which may vary from 0.75 per cent. to 4.4 per cent.—I am, etc.,

O. LEYTON.

London, W., Aug. 23rd.

THE OBLIGATIONS AND CONSEQUENCES OF THE WAR TO MEDICAL AND ALLIED SCIENCES AND THE HONOUR AND INTERESTS OF THE MEDICAL PROFESSION.

SIR,—The letters in this week's issue of the JOURNAL have been most interesting, and I hope you will allow me space to comment upon them. In reply to "Adult," I would suggest there is no need for his recommendations, for the British Medical Association already possesses all the office room and the organization necessary for carrying out his suggestions without any additional whole-time officials and expenditure.

Dr. Hawthorne is absolutely right in saying that "medical practitioners require the provision of convenient facilities for post-graduation study." But, in industrial centres, medical organization is so defective that they would be unable to avail themselves of such facilities, even if they were provided. Again, I agree with him when he states "that the existence of clinical and laboratory educational opportunities is a necessity of modern medical practice, and that any scheme for the future which neglects this need will be seriously or even fatally defective." How these things can be done in connexion with the State Insurance Medical Service is what I have been puzzling at for some considerable time, and I wish Dr. Hawthorne and others would try and help to work out the problem.

All my medical life I have taken an active part in political and municipal work, deriving from it great pleasure and satisfaction, and probably in consequence am better able to judge correctly upon matters affecting both the profession and the public. During most of these years I have been a member of a county borough council. With deep regret I affirm that never during the twenty-seven years of my medical life has the medical profession been in such bad odour with public authorities as it is at the present time. I honestly believe that the cause lies in such phrases as "the honour and interests of the medical profession," "freedom from unnecessary lay control," "inadequate remuneration," etc. A medical hierarchy would be just as hateful to a British community as was the Papal hierarchy of the Middle Ages.

I shall never forget the howls of derision which once greeted my statement at a medical meeting that the medical profession only existed for the good of the community. It is this inability to realize their *raison d'être* which makes it so impossible for public authorities to deal with doctors.

The great after-the-war question which has to be settled between the profession and the public is, "How is the most efficient medical service for the community to be provided?"

And, if we are to gain the confidence of the public, we must base all our schemes on the fact that we are primarily British subjects and only secondarily members of the medical profession.—I am, etc.,

FERDINAND REES.

Wigan, Aug. 26th.

A FLAW IN THE RETAIL DISTRIBUTION OF MILK.

SIR,—Twice recently within a fortnight milk purporting to be "nursery milk" was left at my house in a dirty bottle. This was obvious from the fact that when the milk was poured out the bottom of the bottle was found to be crusted inside with dirty, dried milk. I may mention that the milk was furnished by one of the large London dairy companies. On a complaint being made to the manager of the local branch, the girl who brought the milk round confessed that she had given some one else the nursery milk intended for us, and had filled a dirty bottle collected from another house with milk from the churn and left it with us as nursery milk. When an allowance is made for the dislocation of labour consequent upon the war, it is disquieting to think that our infants are liable to be exposed to such grave risks as are incurred by the procedure above mentioned. It makes one shudder to think of the myriads of bacteria there may be in the bottom of a dirty, unwashed milk bottle which has stood in somebody's area or back garden, possibly for twelve or more hours, and as often as not in close proximity to a dustbin or water-closet, and then to think of a pint of milk being put into such a bottle and left at one's house as food for an infant. If such a condition of things obtains in a good residential district where the price of nursery milk is 6d. or even 7d. a quart, it is no wonder that our children's hospitals are flooded with cases of gastro-enteritis from the poorer quarters, especially at this season of the year.

When I interviewed the secretary of the company with reference to my complaint he admitted that it was a serious matter, but that he could not easily prevent it, although instructions were given to men and girls who distributed the milk that they were on no account to fill dirty bottles with milk from the churns. He asked me what I could suggest to prevent it.

In the first place, I would suggest that all persons concerned in the distribution of milk should receive elementary instruction in the potentialities for evil inherent in dirty milk, especially to infants and young children. Secondly, the filling of dirty bottles or cans collected from houses should be absolutely forbidden, and it should be impossible for anyone but an authorized person to have access to the cardboard discs with which the bottles are closed. Thirdly, bottles or cans with "nursery milk" should be filled only at the dairy and sealed with some sort of label to which again only an authorized servant of the company should have access. Fourthly, I would suggest that it should be made a punishable offence for any one to put milk, and especially milk intended for the food of infants, into a dirty bottle and that notices to that effect should be prominently displayed in every dairy.

Another point in this connexion is that the company in question, so the secretary informed me, was pasteurizing all the milk (general and nursery) it was supplying to customers. Apart from the absurdity of putting pasteurized milk into dirty bottles, the question arises whether it is right to describe such milk as fresh. Customers should be informed when milk is pasteurized, otherwise there is the possibility that it will be boiled again (as is always done in my own household) with the result that infants fed on this twice sterilized milk run the risk of developing scurvy.—I am, etc.,

DAVID NABARRO.

London, W., Aug. 27th.

Universities and Colleges.

SOCIETY OF APOTHECARIES OF LONDON.

THE diploma of the society has been granted to Messrs. H. H. Bailey, C. P. Barber, I. H. Beattie, S. F. Cheesman, H. M. Hobson, L. A. B. Moore, E. O. Morrison, T. W. Robbins, J. M. Wall, and R. H. Yolland.

Obituary.

THOMAS GREGOR BRODIE, M.D., F.R.S.,

PROFESSOR OF PHYSIOLOGY IN THE UNIVERSITY OF TORONTO.

PROFESSOR BRODIE died on Sunday, August 20th, at his Hampstead residence, quite suddenly and unexpectedly. He had been suffering from a mild attack of gout during the previous week, but on the morning of his death he was bright and seemed much better. He took breakfast in bed, and it was while he was reading a newspaper after the meal that he was seized with sudden heart failure and expired in a few minutes.

He was the second son of the late Rev. Alexander Brodie, Vicar of Grandborough, and was born at Northampton in 1866, so that he was just over 50 years of age when he died. He was educated at King's College School, and later proceeded to St. John's College, Cambridge; then he decided to take up a medical career, and received his medical education at King's College, London. He was there one of a band of exceptionally brilliant students, several of whom are now on the King's College Hospital staff. Brodie was a leading spirit among them, carried off most of the prizes the College had to offer, and would have proved eminently successful in any branch of medical science he chose to select. His choice fell on physiology, and after he had taken his M.D. degree he became demonstrator in physiology at King's College under Professor Halliburton in 1890. Subsequently he was appointed senior demonstrator in physiology at the London Hospital, and on Professor Sherrington's resignation of the lectureship in physiology at St. Thomas's Hospital was elected to succeed him. He resigned this post when a little later he was appointed director of the Research Laboratories of the Royal Colleges of Physicians and Surgeons. This was a post which specially suited his capabilities and character, and here he not only published brilliant research work of his own, but gathered around him a band of workers whom he inspired by his energy and contagious enthusiasm.

When the Royal Colleges on grounds of economy decided no longer to retain their laboratories, Brodie was for a time without any position; but this state of things lasted only a few months, and he was almost simultaneously elected to three posts, namely, professor of physiology at the Royal Veterinary College, lecturer on physiology at the London School of Medicine for Women, and professor-superintendent of the Brown Institution under the University of London. This pluralism was necessary, for each appointment individually did not yield a living wage; this is an illustration, by the way, of the manner in which scientific men are rewarded in this country. The labour of having to look after three sets of duties was far too great, but did not deter him from the prosecution of important original researches, for which in 1904 he was rewarded by obtaining the F.R.S.

In 1908 he accepted, after considerable hesitation, the professorship of physiology at the University of Toronto, and he was holding this chair at the time of his death. For domestic reasons, the most important of which was the education of his sons, he continued to keep on his London house, and it was here he spent the long vacations which Canadian professors enjoy; but he took very little real holiday, for research work mainly occupied his time in the vacations. Last year he came over in a different capacity—namely, as captain in the Canadian Medical Service, and this summer also he held the same position. His services in relation to original work arising out of the war were invaluable, and his investigations were carried out at the London School of Medicine for Women, the Endell Street Hospital, and more recently at the Military Hospital at Ramsgate. The subjects he specially took up were respiratory changes in disease and injury, and the means of re-educating maimed men to resume a useful life.

His published papers are very numerous, and deal with many branches of physiological science, but his bent was mainly physical, as foreshadowed in his first published paper on the elasticity of muscle. He will perhaps be best remembered for his epoch-marking work on the kidney and for his views on the functions of the glomerulus, which formed the subject of his Croonian lecture delivered before the Royal Society. But whether his work was chemical or physical, it was always characterized by great originality and by a never-failing resourcefulness in devising means for overcoming difficulties. He was a brilliant operator, and invented numerous pieces of useful apparatus. He also published a textbook on *Experimental Physiology*. He was not a very ready writer, but everything he wrote showed evidence of care and thought. He has left unpublished or uncompleted much manuscript, which his friends intend shall see the light as soon as practicable.

As a teacher he was very successful, and he never failed to win the respect and affection of his pupils. He made no pretence of being an orator, but his deliberate incisive manner compelled attention to his lucid expositions.

The writer of these lines can also speak of Brodie as a personal friend, and here words fail to do him justice. He was a friend worth having—loyal, affectionate, bright, and delightful in every sense of the word.

He had interests outside his professional work, for he was a keen student of literature and an adept in all forms of athletic sport, golf, perhaps, being his favourite relaxation. He was never so happy as when he was carpentering with his boys, or tramping or bicycling with his friends, the leader in all their fun and merriment.

He had been married for twenty-two years, and his widow (*née* Alice Sims) survives him. So also do his three fine boys, all chips of the old block; the eldest is in the army, and is home now wounded for the second time; the second, in the navy, passed scatheless through the Jutland battle; the third is still at school.

His funeral took place at Hampstead on August 23rd with full military honours, and there were but few dry eyes when the notes of the Last Post concluded the sad ceremony. His relations and personal friends hurried from their holiday resorts to pay him the last tribute of respect, and in addition there were representatives of his own company, including General G. Carleton Jones, Colonel Adami, and other Canadian officers. Among those present may be mentioned: Sir William Osler, Professors Cameron and J. J. Mackenzie (Toronto), Professor and Mrs. Waller, Professor Halliburton (representing the Royal Society), Professor Cathcart, Dr. and Mrs. Mott, Mrs. George Buckmaster, Mrs. Albert Wilson, Drs. Bryett, Cadman, Hugh Playfair, A. E. Russell, Sandifer, and Whitfield, Miss Cullis, Mrs. Tribe, Miss O. Lewin, and other members of the London School of Medicine for Women and the Endell Street Hospital.

The writer feels he cannot conclude this brief and imperfect tribute to his old friend without once more alluding to the indifference with which this country regards its scientific workers. Here was a man with exceptional power and brilliant gifts, but still unable to obtain in his native land a position and a competence worthy of his greatness.

KARL GROSSMANN, M.D., F.R.C.S.EDIN.,

CONSULTING SURGEON, STANLEY HOSPITAL, LIVERPOOL.

DR. KARL AUGUST GROSSMANN died in London on August 24th, at the age of 65. He had suffered for some time from anginal attacks, and recently had grown rapidly worse. He graduated M.D.Freiburg in 1874, and came to England some thirty-five years ago with very high credentials from his German teachers. He took the diploma of L.R.C.S.Edin. in 1879, and the Fellowship of the same College in 1889.

While at Freiburg he was assistant surgeon to the University Eye Infirmary, and when he came to this country took up the special practice of ophthalmology. He was appointed the first ophthalmic surgeon to the Liverpool Stanley Hospital, and soon came to be recognized as a leading authority on the eye and as a brilliant operator. He threw himself heartily into the professional life of Liverpool; he was a well-known figure at the debates at the Medical Institution, where he held office as librarian and vice-president. He was a member of the Council of the Lancashire and Cheshire Branch of the British Medical Association from 1899 to 1911, and was the representative of the Liverpool (Western) Division from the first Annual Representative Meeting at Swansea in 1903; he continued to represent that constituency until 1907. He was one of the local secretaries of the annual meeting of the Associa-

tion in Liverpool in 1912, and was a vice-president of the Section of Ophthalmology at the annual meeting at Aberdeen in 1914.

His mind was essentially original and his industry never flagged. In a great seaport the question of colour blindness is of perennial interest, and Dr. Grossmann threw himself into the discussion and investigation of the subject with his usual energy. He devised a set of tests for colour vision which were generally considered very excellent, though they were not generally adopted owing probably to the practical difficulties attending their manufacture on a commercial scale. Some twenty-five years ago, following a severe illness, he had to take a prolonged holiday and spent a winter in Egypt, where he did excellent work in the investigation of ophthalmia. More recently he made very original investigations on the mechanism of accommodation, proving that, contrary to the general teaching, the curvature of the posterior surface of the lens changes during the act.

His interests and energies were by no means confined to his strictly professional work. He was a wide and intelligent traveller, and he had done some mountain climbing in his early days. He had an intimate knowledge of German, French, and Italian, as well as of English, and during the last few years had seriously taken up the study of Russian. He undertook two journeys across Iceland, and explored the celebrated ice caves, when he made investigations on the forms of the ice crystals, which led him to novel conclusions as to the true form of the crystallization of water, conclusions which he brought before the Royal Society and published in *Nature*. Another result of his visit to Iceland was a clinical study of lepra ophthalmica founded on observations made at the leper hospital in Laugarnes, Iceland, in 1901 and 1904. He read a paper on the subject at the Annual Meeting of the British Medical Association at Leicester in 1905, and gave a demonstration of a number of natural colour photographs, some of which were produced in the JOURNAL to illustrate the report of the paper when it was published on January 6th, 1906.

He had great taste in music, and for an amateur was a brilliant performer on the violoncello, and he was a draughtsman of no mean skill.

A man with so many interests and accomplishments had naturally a host of friends in various countries and in many walks of life. He had a lively sense of humour, and was generous almost to a fault. He leaves a widow, but no children.

JOHN B. MURPHY, M.D.,

CHICAGO.

DR. JOHN BENJAMIN MURPHY of Chicago, one of the foremost surgeons of the United States, died suddenly of heart disease on August 11th. He was born at Appleton, Wisconsin, in 1857, and took his degree at Rush College, Chicago, in 1879. After three years of practice he studied two years in Germany. On his return to Chicago he soon gained a great reputation, especially in abdominal and bone surgery. In 1895 he was appointed professor of clinical surgery in the Chicago Post-Graduate Medical School, and later he became head of the department of surgery in the North-Western University Medical School. He was chief surgeon to Mercy Hospital, and held several other public appointments. "Murphy's button" made his name known to the whole profession; it was successfully used by him in a case of gangrene of the intestine as early as 1892. In 1898 he recommended the production of artificial pneumothorax by compression of the affected lung with nitrogen. He was very successful in replacing bone tissue by grafts of cartilage. He was president of the Clinical Congress of North American Surgeons, held in London in 1914, when he delivered an address on arthrodesis and bone transplantation, in which he gave an account of his operative treatment of joints that had long been ankylosed. The essential point in the procedure is to free the fixed joint and to interpose between the bones a flap of soft living tissue to form the lining of the new articulation. When Colonel Roosevelt was wounded in Chicago in 1912 Dr. Murphy had charge of the case. He was a member of the Deutsche Gesellschaft für Chirurgie, of the Paris Société de Chirurgie, and of other scientific bodies. Many distinctions were bestowed upon him in recognition of his work. In 1908 he received the honorary degree of Doctor of Science from the University of Sheffield; in 1911 he was president of the American Medical Association, and in 1916 he received from the Pope the collar and cross of the Order of St. Gregory the Great.

Dr. Murphy was the author of many contributions to medical literature. The most important of these were a report of an original research on cholecysto-intestinal, gastro-intestinal, entero-intestinal anastomosis, and approximation without sutures (*Medical Record*, 1892); intestinal approximation: pathological histology of reunion and statistical analysis (*Medical Record*, 1894); operative surgery of the gall tracts, with report of twenty successful cholecystenterostomies by means of the anastomosis button (*Chicago Medical Recorder*, 1894); an experimental and clinical research on the resection of arteries and veins injured in continuity—end-to-end suture (*Medical Record*, 1897); surgery of the lung (*Journal of the American Medical Association*, 1898); two thousand operations for appendicitis, with deductions from personal experience (*American Journal of Medical Sciences*, 1904). Dr. Murphy was editor of *International Clinics* from 1901 to 1905. A living record of his clinical teaching may be found in his *Surgical Clinics*, the first number of which was issued in February, 1912. Reviews of this publication, which contains much valuable matter, have appeared from time to time in the BRITISH MEDICAL JOURNAL.

THE LATE SIR VICTOR HORSLEY.

THE Medical Secretary has received from Lady Horsley a letter asking him to convey to the Representative Body her sincere thanks for its commemoration of her husband's work for the Association and the medical profession, and her gratitude for its sympathy with her.

We have received from a correspondent in Amara the following letter dated from that place, Sunday evening, July 16th:

I have just been to the Rawal Pindi Hospital, where Sir Victor Horsley was lying ill, to find that he passed away a few minutes ago—at 8.45 p.m.

He had only three days ago returned to Amara from the front and seemed to be in his usual health and spirits. Only yesterday (Saturday morning) I had some conversation with him on a subject which was interesting him—the provision of hospitals with laboratories; and he then set out to walk back to his camp, which was about a mile and a half away across the Tigris bridge and over the open plain. The shade temperature was over 110° and the atmosphere humid. When he got to his tent he heard there was a sick officer he knew, about half a mile further on; he went on to see him and examined him carefully. He complained of headache later in the afternoon and was admitted to the Rawal Pindi Hospital on Saturday evening about seven o'clock. His temperature rose, he had a rather restless night, and in the morning seemed worse. His temperature rose all day and finally reached nearly 110° F. He became comatose in the afternoon and passed away after little more than twenty-four hours' illness. The cause of death appeared to be heat-stroke, a condition which carries off many people nowadays in Mesopotamia.

The news of his death has been received with the greatest sorrow and regret even in these days when the loss of friends is almost our daily portion, and it will be a large and representative following he will have to his last resting place to-morrow in the Amara Cemetery.

It would ill become one who has only known him personally within the last few months to write of his many and great achievements in the past, but I can speak of his untiring energy and the loyal devotion and singleness of purpose shown in his every action up to but a few hours ago. Those who have met him recently are aware that he had framed a very severe indictment against those he believed were responsible for the mismanagement which he thought characterized some aspects of the campaign. It is only three days since he returned from the front, and he was about to return to India for a spell to prepare his report.

He has been urged time and time again to curb his extraordinary energy and not to put too severe a strain on his physical capacity, but it appears that he underestimated the baneful effects of the severe climatic conditions existing just now in Mesopotamia. It would have been easy for him to have pleaded the heat or his increasing years, but he refused to take things easily, and has sacrificed himself to his zeal for bettering the conditions

of the soldier, and has died for a cause which almost justified even so great a loss to his friends and to the ideals of the medical profession of which he was so devoted a champion.

WE regret to record the death on August 15th, at Oxford, of Dr. EDWIN BENJAMIN GRAY. He was in his 85th year and was the oldest medical practitioner in the city. His death was due to advancing age and bronchitis. Dr. Gray, after graduating from Exeter College in 1852, joined St. Bartholomew's Hospital and became an M.R.C.S. in 1856 and D.M.Oxford in 1861. After obtaining his medical qualification, he held first the post of house-physician and afterwards honorary physician to the Radcliffe Infirmary, which post he resigned in 1884; he was at the time Litchfield lecturer in clinical medicine and examiner in medicine of the University. He was a member of the British Medical Association and the Oxford Medical Society, and took a very keen interest in all medical matters up to the time of his death. For many years he had a wide connexion in the county and district as a consulting physician, and his opinion was highly valued. In 1902 he had a severe and prolonged illness which caused him to retire from professional work. He leaves a widow, two sons, and a married daughter.

The Services.

INDIAN MEDICAL SERVICE.

CONSEQUENT on the suspension during the period of the war of examinations for promotion, lieutenants of the Indian Medical Service with (1) less than three years' service, and (2) those who have not been able for approved reasons to present themselves for examination, will, if fit in all other respects, be promoted permanently on completion of three years' full-pay service, while those who have completed three years' service but have not passed or failed to pass the prescribed examinations will be promoted from October 22nd, 1914.

EXCHANGES.

CAPTAIN R.A.M.C.(T.F.), at present on leave, due back in India middle of October, desires to exchange with M.O. (must be a Territorial) doing duty at home.—Address C. F. M., Furnham House, Chard, Somerset.

Captain R.A.M.C.(T.), R.M.O., wishes to exchange from home service regiment to active service abroad (France or Salonica).—Address No. 3398, BRITISH MEDICAL JOURNAL Office, 429, Strand, W.C.

Lieutenant R.A.M.C. would like to exchange with medical officer desirous of going to Egypt.—Address No. 3400, BRITISH MEDICAL JOURNAL Office, 429, Strand, W.C.

WE have received from Messrs. Frederick R. Butt and Co., 147, Wardour Street, London, a catalogue of *x*-ray apparatus, tubes, and accessories, which shows that they are prepared to supply everything, or nearly everything, the *x*-ray operator requires. Most of the apparatus appears to be of their own manufacture, but they also supply platinum and tungsten target tubes of American manufacture. The catalogue contains a number of useful hints on the use of the more modern and delicate pieces of apparatus. It is well illustrated and provided with an adequate index.

THE American Rights League has been formed to uphold the duty of the United States Republic in international relations. The president of its New York Committee is Mr. G. H. Putnam, and of its Boston committee, Mr. W. R. Thayer. The secretary of the league is Dr. Richard C. Cabot, associate professor of medicine in Harvard University. The league has recently directed its attention to the case of Captain Fryatt, and has issued a leaflet on "The Society of Nations *versus* Germany," written by Dr. Munroe Smith, professor of jurisprudence in Columbia University, New York, and another containing an expression of the opinion of Professor Stowell of the same university. Professor Stowell writes that the German authorities tried Captain Fryatt "under a regulation which they had enacted in violation of the law of nations; neither did they allow a reasonable publicity to the proceedings, such as is due out of respect to the opinion of mankind, that they may make felt their influence against abuses of bureaucratic action." In transmitting this opinion Dr. Cabot points out that, "although the case is not more shocking than many acts of the German Government, it is a clear reminder that Germany still defies our ideals of law and righteousness. It comes to us bringing not the dazed surprise caused by the invasion of Belgium, but a sort of familiar horror."

Letters, Notes, and Answers.

THE telegraphic addresses of the BRITISH MEDICAL ASSOCIATION and JOURNAL are: (1) EDITOR of the BRITISH MEDICAL JOURNAL, *Aitiology Westrand, London;* telephone, 2631, Gerrard. (2) FINANCIAL SECRETARY AND BUSINESS MANAGER (Advertisements, etc.), *Articulate Westrand, London;* telephone, 2630, Gerrard. (3) MEDICAL SECRETARY, *Medisecra Westrand, London;* telephone, 2634, Gerrard. The address of the Irish office of the British Medical Association is 16, South Frederick Street, Dublin.

☞ *Queries, answers, and communications relating to subjects to which special departments of the* BRITISH MEDICAL JOURNAL *are devoted will be found under their respective headings.*

QUERIES.

INCOME TAX.

X. Y. Z. inquires as to the procedure and liability in the following case. A doctor whose net income was £500 from private practice and £180 from public appointments, joined the R.A.M.C. early in 1916, and is now in the East, having left a power of attorney and put a locumtenent in charge of his practice.

*** Prima facie, the absentee practitioner is liable to tax on the full (average) profits of past years, but under Section 13 (1) of the Finance Act, 1914 (Session 2), as continued by the Finance Act, 1916, he can claim an adjustment of his assessment from the "average" to the amount of the actual profits of the year, inasmuch as he is serving in the forces of the Crown. We therefore suggest that the person holding the power of attorney may be able to arrange with the surveyor of taxes for the locality where the practice is situated for an estimated assessment to be made, based on the probable amount of the profits of the practice (after deducting the expenses incurred in respect of the locumtenent) for the year to April 5th, or March 31st, 1917. Tax will be payable in two moieties in January and July, 1917, and before the second moiety becomes due there should be sufficient information available to allow of that tax to be diminished or increased to the balance necessary to account for the full liability of the year. It will probably be found advisable and sufficient to make one return to include the appointments as well as the private practice.

ANSWERS.

BOOKS ON SANITARY LAW.

S.—The best book on sanitary law is one which contains the original Acts. Such a book is *Public Health Acts*, by Davey, 8s. 6d. (London: Knight and Co.). A new edition has appeared recently. A popular book on sanitary law for D.P.H. examinations is *Handbook of Sanitary Law*, by E. Burnett Hano, 3s. 6d. (London: Lewis). Another popular book is *Sanitary Law and Practice*, by Robertson and Porter, 12s. 6d.

LETTERS, NOTES, ETC.

GARLIC IN WHOOPING-COUGH.

CAPTAIN A. STEVENSON, M.D., R.A.M.C. (Lark Hill, Salisbury), writes: Besides being used with good results in whooping-cough, as Dr. Hovell has mentioned in his instructive note in the BRITISH MEDICAL JOURNAL of July 1st, "garlic" can also be used with very successful results in treating tuberculosis both of the lungs and the joints. Two cases under my care were treated by garlic juice applied on lint, and covered with gutta-percha tissue. Both were adults. One, a case of tuberculosis of the spine with lung infection, was successfully treated by rest in bed with extension, and the application of garlic juice over the diseased spine. For the lung condition he had an inhalation. The other was a case of tuberculosis of the wrist-joint, which also completely recovered under the use of garlic juice and rest on a splint. In using garlic juice some vesication may occur, which, however, soon disappears. Garlic juice can also be given as an inhalation in lung cases.

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